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IN the *Railway Age Gazette* of December 9, 1910, page 1105, we gave some figures to show that the charge of railway obstruction of waterway development of Connecticut harbors and their water fronts was unfounded. Among the ports named was New London, where two rival railway lines—the Grand Trunk and the New Haven—have their water front terminals, the latter owning a total of 1,880 ft. of water frontage. But, outside of railway ownership, there are in the city of New London and the town of Groton, on the opposite side of the Thames river, miles on miles of unimproved water frontage, above and below the drawbridge. Harbor and river are both deep; the deep water runs near shore and the federal government has spent, first and last, $159,000 on improvement of the harbor and $539,000 on the Thames river. Where Nature had done so much and our government had done still more, it might have been inferred that private enterprise would do the rest and develop the waterway business of the port. But it did not, and New London has now made a successful appeal for state aid and secured from the Connecticut legislature $1,000,000 for waterfront development. The big appropriation is unique in the history of the state. It had also its perils as a precedent; what New London secured yesterday, New Haven, Bridgeport and Stamford may demand tomorrow. But all that is a matter for the Connecticut tax payers. The main points to notice are that those tax payers will now be called on to subsidize at the rate of some $40,000 a year—interest on $1,000,000—a seaport which the railway companies have already developed as far as they care to; that those railways have asked for no state subsidy; and that if in the future—as is not at all likely—waterway rivalry with the railways and their boat lines should develop, the cost of it to the Connecticut taxpayer should be taken into account. The New London case is not in itself important, but is symbolical and commends itself to the present and future attention of the theorists who expound the proposition of highly subsidized water competition with the unsubsidized railway, even in a case where private enterprise, under the most favorable physical conditions, defaults.

THE "Orphan," whose letter we print in another column, speaks forcibly on a number of interesting and vital questions regarding the supply department. We think that he takes up the cudgels rather more energetically than he needs to; perhaps he is being influenced by faulty premises as to the ability of the "Old Railway Official." He replies to the latter with statements, some of which are his own conclusions rather than detailed evidence. If "D. A. D." did not have the facts at hand, but was dealing in generalities and drawing conclusions without knowing enough of the subject to qualify him to do so, it might be pardonable to dismiss his ideas as summarily as "Orphan" does. But "D. A. D." has had, not only on railways but in other lines of activities, just the practical experience in storekeeping which "Orphan" assumes he has not had. His conclusions may be wrong, but they cannot be dismissed on the ground that he does not know what he is talking about.

THE Illinois Manufacturers' Association, which includes many manufacturers both large and small in Illinois, has asked a committee of prominent citizens of the country, including lawyers, educators and business men, to draft an amendment to the Sherman anti-trust law, the enactment of which by Congress will make clear to the business interests of the country just what forms of business combinations may be effected and at what purposes they may aim. The statement issued by the association includes railways among the concerns which are or may be harmed by rigorous enforcement of the law as it stands; and James J. Hill is one of those asked to serve on the committee, which it is proposed shall draft an amending statute. It is impossible not to recall that it has not been long since this association started a movement for action by the government against the railways under the Sherman act on the ground that their concerted attempt to raise freight rates was in violation of that law. Furthermore, the association sent representatives to Topeka, Kan., to attend a meeting of persons desirous of having the Sherman law enforced against the railways, and this meeting adopted resolutions, which we suspect were framed by the representatives of the Illinois Manufacturers' Association, denouncing the roads' alleged violation of the Sherman law and demanding their prosecution. In other words, so long as it was only the railways who were charged with disregarding the anti-trust law the Illinois Manufacturers' Association regarded it as a good statute and was quite willing to put it in operation against them and benefit by its provisions, however unjust. When, on the other hand, concerns belonging to the association find themselves in danger of prosecution it immediately becomes very solicitous that the law shall be so changed that it shall be adapted to the requirements of equity and economic conditions; and it does not hesitate to call upon

the railways, whom it was trying to get prosecuted, to help get the amendments. There does not seem much chance for intelligent revision of the Sherman law; and that this is true is largely due to organizations such as the Illinois Manufacturers' Association, which for years have carried on unfair propaganda against the railways which have helped create a radical public sentiment in the United States regarding not only railways but all other large corporate interests. There has been no statement regarding railways too injurious, no attack too libelous, for some of these organizations to give the wildest circulation. There have not been wanting those who foresaw and predicted that the public misconceptions regarding the carriers that were thus being fostered would lead to the development of a belief on the part of the public that all large corporations were over capitalized, were being mismanaged, and were grinding the faces of the people. But the campaign of misrepresentation, often by paid agitators, went on. The mistaken and hostile public opinion regarding all large industries which was feared has developed, and the fools who rocked the boat now find themselves in the water along with the railways, whom alone they intended should get a bath. The severe regulation to which the railways have in recent years been subjected has had many bad results; but it has had some very good ones, too. Whatever the immediate results may be, the ultimate effects of hazing some of the large industrial corporations in the same way for a while might not be wholly bad. After they have had some such experience as the railways have been going through they will learn, what has long been clear to many persons, that the question of the proper relations between large industrial concerns and the public is not essentially different from the question of the proper relations between the railways and the public; that they constitute one big problem; and that if all of us in the United States do not want to continue steering straight for socialism it is high time that the best minds in business and the best minds in statesmanship should get together and try to work out a constructive policy for the public regulation of business which will adequately protect the public, and at the same time will not put undue burdens and restrictions on private enterprise, whether it be engaged in running a railway or a manufactory.

NORTHERN PACIFIC.

THE Northern Pacific in the year ended June 30, 1911, cut down operating expenses, especially maintenance of way expenses, to a quite extraordinary extent, and did this without detriment to the physical property. There will probably have to be a greater renewal of rails within the next year or two than in the last two, but the property as a whole is in very good condition. This seems remarkable when the details of the roads operating expenses are studied.

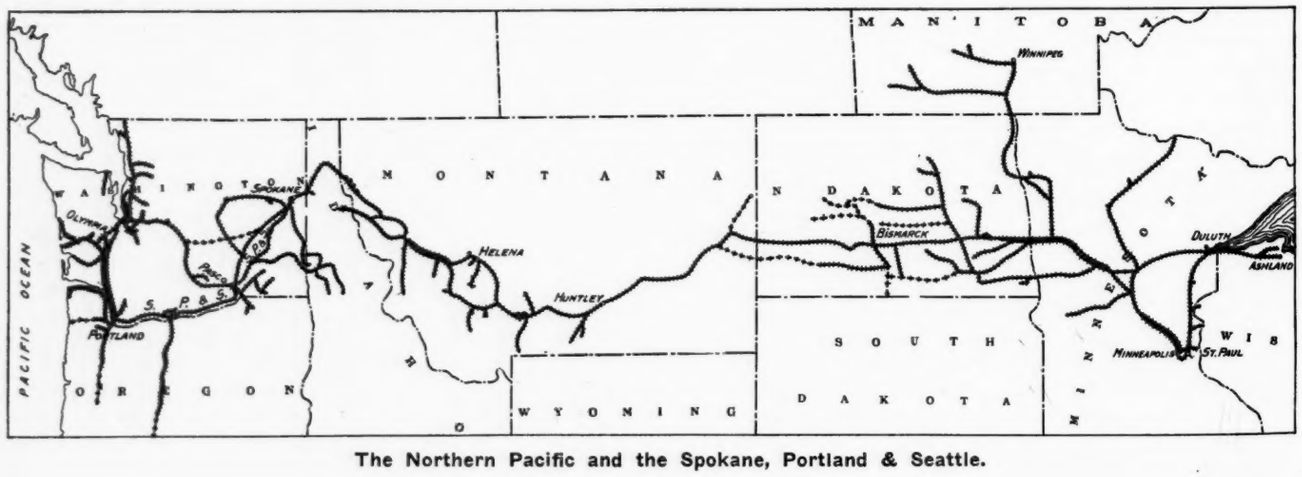
In 1911 the company spent $23 per track mile for ballast for maintenance work, and $29 per mile for rails for maintenance. For ties, however, $205 was spent per mile of track. These accounts are mostly costs of material, labor cost not entering into them to any extent. Such relatively small sums spent for rails and ballast show that the company has found it necessary to hold down expenses as closely as was possible, and it has been able to do so because of generous expenditures for maintenance in the past. A remarkable saving is made in the roadway and track account. In 1910 the company spent $5,346,000, while in 1911 it spent only $3,830,000. This was $529 per mile of track in 1911. This saving made was partly due to a reduced cost of track labor and partly to cutting down forces through a much more economical system of maintaining the property.

Maintenance of equipment was also done more cheaply in 1911 than in 1910; but since the volume of traffic carried, which was less last year than the year before, more directly affects maintenance of equipment cost than maintenance of way cost, the saving is not so remarkable. Last year $7,911,000 was spent for maintenance of equipment, a decrease of $1,081,000. A considerable reduction was made in expenditures of repairs of locomotives last year; and less was spent for repairs of freight cars, and considerably less was charged for depreciation of freight cars, for which there was good reason in the fact that heavy depreciation charges have been made for the last five years, and that the capital sum on which depreciation is computed is less each year. The saving in transportation expenses was the result of a smaller volume of traffic, both passenger and freight, and of more effective work in the operating department. The higher wage scale made the actual cost of transportation per unit* somewhat higher in 1911 than in 1910. The cost per 100,000 units last year was $390, and $376 the year before.

That conditions tended to make necessary a very strict policy of economy last year is quite apparent from the income account, and in comparing 1911 with 1910, it will be recalled that 1910 itself was a very hard year for the Northern Pacific in respect to expense. Last year the company earned $64,069,000 from transportation. This is less by $9,695,000 than revenues in 1910, Expenses last year amounted to $39,730,000, a decrease of $6,258,000 from 1910. The sums received as rentals and as hire of equipment were larger last year than the year before, and gross corporate income amounted to $27,669,000, as compared with $29,475,000 the year before. After the payment of interest and 7 per cent. dividends on the stock, the company had a surplus of $3,082,000, as against $4,936,000 in 1910.

The decrease in freight earnings is explained by President Elliott as resulting from a smaller grain movement, a smaller lumber movement and less marked business expansion in such cities as Butte, Spokane, Seattle, etc. The decrease in passenger earnings is due to lessened business activity and to the absence of such events as the Alaska-Yukon-Pacific Exposition, which took place year before last, and the opening of the Flat-

*The unit taken is passenger miles and ton miles added together. This gives an accurate comparison, as the ratios of passenger mileage to ton mileage were nearly the same in 1910 and 1911.



The Northern Pacific and the Spokane, Portland & Seattle.

head, Coeur d'Alene and Spokane Indian reservations, which in the recent past have helped to swell the roads passenger earnings.

Last year the total revenue ton mileage carried amounted to 4,800,000,000 tons, which is a decrease of 11.41 per cent. from the year before; the ton mileage of company freight was 953,612,242, a decrease of almost 20 per cent. from last year and total passenger mileage amounted to 759,000,000, a decrease of 22.27 per cent. The average haul, both passenger and freight, was shorter last year than the year before, the average for freight per ton being 279 miles in 1911 and 297 miles in 1910; and for passengers, 82 miles in 1911 and 101 miles in 1910. This is a decrease of 17.8 miles for freight and of 19.3 miles for passengers. In the case of freight, greater operating efficiency more than offset the decrease in amount of traffic. The mileage of revenue freight trains was 9,772,000, a decrease of 18.84 per cent. from the year before; the average number of loaded freight cars in train was 25.34, an increase of 7.97 per cent.; the average revenue train load was 461 tons, an increase of 32 tons, or 7.49 per cent.

The fact that while both the average haul and the revenue freight ton mileage decreased the average revenue tonnage per train, which already was large, increased, reflects credit on the efficiency with which the traffic was handled. More favorable weather conditions contributed somewhat to this increase in train load. The total train load—which includes company and commercial freight—also increased from 524 to 553 tons.

The mileage of revenue passenger trains was 11,380,000 in 1911, a decrease of 9.50 per cent. The average number of passengers in train was 63.21 in 1911, as compared with 74.23 in 1910.

The Northern Pacific gets only a fair average rate per passenger per mile and per ton per mile, not by any means as large a ton mile rate, for instance, as the Southern Pacific gets. In 1911 the average receipt per passenger per mile was 2.276 cents, and in 1910 2.184 cents. The average receipt per ton per mile in 1911 was 9.03 mills, and in 1910, 9.00 mills. The following table compares certain train mile figures for the Northern Pacific, the Great Northern and the Burlington:

Revenue per train mile:	
Northern Pacific	$2.94
Great Northern	2.79.8
Burlington	2.53
Expenses per train mile:	
Northern Pacific	1.82
Great Northern	1.72.5
Burlington	1.70.9
Net revenue per train mile:	
Northern Pacific	1.12
Great Northern	1.07.3
Burlington	.82.5

The annual report of the company does not give any figures for classified tonnage carried, but from the company's report to the Interstate Commerce Commission for 1910 we find that 19 per cent. of the total tonnage carried in that year was furnished by products of agriculture; 2 per cent. by products of animals; 24 per cent. by products of mines; 38 per cent. by products of forests; 10 per cent. by merchandise, and 2 per cent. by miscellaneous articles (L. C. L.).

The balance sheet shows that at the end of 1911 the company had $5,932,000 cash on hand, as against $8,397,000 cash at the end of 1910. At the end of 1911 miscellaneous accounts payable amounted to $6,598,000, while at the end of 1910 there were only a few thousand dollars of accounts payable. It is understood, that this "accounts payable" on the 1911 balance sheet is made up largely of sums owed to subsidiary or affiliated companies because of transactions not yet completed and which are now in process of adjustment.

The report would have been more enlightening if it had included a detailed statement of what these accounts payable include, and also a description or list of "marketable securities," which are carried on the balance sheet at $19,363,000.

The showing as regards traffic and earnings made in 1911 cannot be taken as particularly encouraging, but it must be remembered that the Northern Pacific has had a year of decreased traffic following a year of abnormally high operating costs due to bad weather and other causes, and a correct judgment as to any property must be based on the results of a period of years. The road is in sound physical condition; its management is enterprising and efficient; its territory is developing rapidly; and with a change in business conditions generally its earnings may confidently be expected to improve unless the settlement of the transcontinental freight rate cases cuts too deeply into the earnings of all the transcontinental lines.

The Northern Pacific is comparatively lightly capitalized. This point was especially emphasized in the finding of the special master in the Minnesota rate case, in which he placed a much higher value on the property than the amount of the company's total outstanding securities. It is a company which, beside its own great main line between the Pacific coast and St. Paul, has an investment in other very valuable properties. The equity in the stock of the Chicago, Burlington & Quincy, which is deposited under joint Northern Pacific-Great Northern bonds, is in itself a very valuable asset. The Northern Pacific also owns a half interest in the Spokane, Portland & Seattle, and owns nearly all the stock of a subsidiary company—the Northwestern Improvement Company having valuable coal properties.

The Northern Pacific itself is a property that has changed in character very much in the last six years. In 1905 there was no 90-lb. rail in track, and only 529 miles of 85-lb. rail, while in 1911 there was 1,109 miles of 90-lb. rail and 2,000 miles of 85-lb. rail. Indeed all important main lines now have 90- and 85-lb. rail, and the more important branches 72-lb. rail. There is, however, still in main, second and third track 1,696 miles of 56-lb. rail.

While business conditions were unfavorable during the year the company continued making important improvements in addition to the property, for example seven permanent and 77 timber structures having 11,300 lineal feet were replaced by embankments or by truss, girder, eye beam or reinforced concrete trestles, over 120 miles of timber structures have been replaced by steel bridges, embankments or other permanent structures since July 1, 1885. Mileage on block signals was substantially increased during the year, and at its end on important main line mileage of 2,485 there were 401 miles protected by automatic block signals and 914 miles protected by manual block signals. New buildings and increased structures, or increased facilities were provided at 45 stations. The amount charged to additions and betterments was $7,998,106, and the total amount expended in improving and increasing the company's facilities was around $12,000,000.

If the Northern Pacific is feeling the competition of the St. Paul's Pacific coast extension, as it probably is, this may account to some extent for the decrease in passenger and freight traffic last year; but there is quite a tendency for shippers to try a new road when it first builds into their territory, and it may well be that the effect of the St. Paul competition is felt more now than it will be in a year or two.

The following table shows the principal figures for operation in 1911, as compared with 1910:

	1911.	1910.
Average mileage operated	5,950	5,765
Freight revenue	$43,332,918	$48,758,736
Passenger revenue	17,278,813	21,333,313
Total operating revenue	64,912,832	74,525,826
Maint. of way and structures	8,065,462	10,842,955
Maint. of equipment	7,911,231	8,992,137
Traffic	1,127,233	1,036,404
Transportation	21,601,477	24,045,197
Total operating expenses	39,729,761	45,987,405
Taxes	3,296,797	3,622,000
Operating income	22,328,077	25,518,896
Gross corporate income	27,668,506	29,475,201
Net corporate income	20,442,267	22,296,259
Dividends	17,360,000	17,360,000
Surplus	3,082,267	4,936,259

Letters to the Editor.

A LETTER TO AN OLD RAILWAY OFFICIAL FROM AN ORPHAN.

Chicago, October 4, 1911.

To the Editor of the Railway Age Gazette:

If all of the poor railway men who "just growed" had been blessed with an affectionate D. A. D. to check up our shortcomings and steer a true course for us through every emergency that might beset our onward careers, how happy would have been our lot, and how perfect our performance!

No one can witness D. A. D.'s solicitude for his struggling offspring, as expressed in his most interesting and instructive letters in your columns, without wishing that he might have been similarly blessed in his youth, and yet there is always a lurking suspicion that the younger man must be just a little dull-witted to require such exhaustive directions in regard to every detail of his daily work. Perhaps we can forgive him this misfortune because of the good fortune it has brought to the rest of us in permitting us to read and enjoy D. A. D's. admonitions and to admire the keen insight displayed by the older head.

Nevertheless, D. A. D. seems to be convinced that his son must not be permitted to work his brain overtime in solving the problems that the rest of us have had to meet and overcome single handed, and to that extent his fatherly anxiety sometimes leads him into unfamiliar paths.

It is possible that his proximity to the Great Salt Lake when he wrote his letter of July 22 (which appeared in the *Railway Age Gazette* of September 15) inspired the belief that even if he should slip unexpectedly into deep water he couldn't sink, and led him to wade further from the shore than usual. Be that as it may, when he started his correspondence school working on the supply department, it certainly looked to an ordinary orphan as if he had gotten out of his depth.

The question of the proper administration of the supply department is admittedly rather deep water as yet, because its origin is so recent that sufficient time has not elapsed to permit of any exhaustive study of its possibilities, and enough positive data concerning them has not been collected to enable either sire or son to speak with authority regarding this youngest branch of the railway service.

That it has come, and that it has developed to a point where it has attracted D. A. D's. serious attention argues some sort of necessity, at least, for its existence.

D. A. D. characterizes the development of the "so called" store department as "one-sided," and says that *"one of the fallacies introduced by the store people is that the user of material cannot be trusted with its custody, because," etc., etc.*

Now, his son, being a younger man, and therefore presumably more familiar with the happenings of recent years, could tell his D. A. D. a whole lot about the development of the supply department if he only dared to speak up—because it must be remembered that it originated only a few years ago, after the older man had won his spurs and retired from active service. For instance his son, who was a division superintendent when the first supply department was organized and, therefore, more closely in touch with what was actually "doing" out on the line, might have told him that the new department was not the result of a fanciful whim on the part of some one with a genius for organization, but that it originated solely from the necessities created by existing conditions; that it's mission was to stop or, so far as possible, to check the waste and abuse of material which had grown to such proportions on many railways that it had literally forced itself upon the attention of the "men higher up."

He might remind his anxious parent that from the day the first rails were laid in this country in 1827, and for a period of over sixty years, the users of material were busy demonstrating the truth of what D. A. D., from the safe recesses of his easy chair, proclaims a "fallacy," and that their demonstration was so successful and conclusive that it was directly responsible not only for the birth, but for the remarkably rapid development of the "so called" store department.

He might further remark in passing that as to the "introduction" of the aforesaid "fallacy" the store department pleads "not guilty," and rests its case upon evidence obtainable from those railways which have not as yet established such an organization.

As to the development being "one-sided," a great many things appear that way to the observer who regards them from only one point of view.

Considering the obstacles with which it has been surrounded, both by misguided friends and well-meaning foes, the wonder is that the new department survived long enough to develop even on one side.

These adverse conditions have acted temporarily to check its growth and hamper its usefulness, but until it has reached a more perfect stage of development it is somewhat premature to decide that it cumbers the ground and acts as a brake on the wheels of progress.

Before concluding his letter, the writer propounds a few questions which are shrewdly calculated to cast some doubt upon the efforts being made by the department to better existing conditions and to make his youthful general manager a little uneasy with regard to the ultimate effect of those efforts upon the operations of the railway. There is no need, however, for the boy to become unduly alarmed. No movement of any consequence is ever fully consummated in a moment. It takes time to reach perfection. The mistakes of today are corrected tomorrow. The answers to the questions are not difficult.

He asks, "Have we not overdone the matter of low working stocks?" The answer may be found by consulting the official records of a considerable majority of the railways, including the roads which he mentions by name, as well as the "happy medium." A comparison of these figures with those of a few of the other equally well managed railways will show conclusively that the matter of low stocks of material has not been overdone by the average road.

> "Is it not more expensive for a railway to carry too small a working stock of material and supplies than one too large?"

The answer is, yes, *up to a certain limit.* The first and most important function of the supply department is "to supply," as might be inferred from its name. This means that it must be prepared to supply *on demand* material of every description requisite for the operation and maintenance of the property, catastrophies and unusual emergencies alone excepted. Unless it does this it has not reached a proper and normal stage of development. Another of its functions, second only to this, is the performance of its duty with the minimum possible investment of the company's funds.

The next three questions are the same in substance, but phrased in three different ways. No one has ever claimed that "very rigid comparisons" can be instituted between different roads in respect to the operations of any department of the service, and yet comparisons are being constantly instituted as to details of operation and maintenance on different roads, from which great good is derived, even though they may not be "very rigid"; such comparisons, for example, as fuel consumption per 100 ton miles or per locomotive mile; maintenance of equipment, per locomotive, per car and per mile; maintenance of way and of structures; tons moved per train mile and per car mile, etc., etc. All these are made possible by the uniformity of accounting enforced by the Interstate Commerce Commission, and so soon as the accounting for supplies can be placed upon a uniform basis, similar beneficial comparisons can be drawn between the operation of the supply department on different roads, the conditions under which they are operated being generally known.

"Are not some records for seemingly low economical stocks based upon the fallacy that it costs the company nothing to ship and reship its own materials?"

And the following question is like unto it:

"Where would these records land if company material carried a freight charge of, say, five mills per ton per mile?"

There is no doubt but that there is at present a wide diversity in the methods of supply department accounting employed by different railways. It does not follow, however, that records which disclose seemingly low stocks are necessarily based upon fallacies of any kind. Unfortunately, it is true that some roads select methods of accounting which do not always disclose all of the facts, and to that extent they fool themselves, as well as others.

There is no question but what the cost of transportation is a factor in the economical assembling and distribution of supplies, and should properly be considered as part of the cost of operating the department. On some roads the number of ton miles of company material handled during the year by the transportation department is made a feature of their records, but uniformity in the accounts of the department would go far to answering these questions in a satisfactory manner.

"Is it not more economical to handle numerous items of supply in carload lots regardless of average monthly consumption?"

It is more economical as a rule to handle supplies in carload lots, but not without regard to the average monthly consumption. For instance, if a given road used, let us say, an average of five tons of a certain kind of tool steel in a year, it would not be economical to buy a carload of forty or fifty tons to protect its requirements in that line. True economy in the handling of the material is an important feature of the work of a properly organized supply department.

"Have we given due weight to the concealed items of expense in arriving at conclusions as to the cost of handling company material and supplies?"

Up to date we have not, as a general rule, but this is one of the features which is being rapidly worked out and brought to the attention of managing officials through the work that is being done by the Railway Storekeepers' Association. The same question might properly be asked with regard to the work of every other department of the service, the present organization of which has been the outcome of many years' experience.

The necessities of time and space both forbid a more extended analysis of the ideas advanced by the Old Railway Official as to the relationship which the store department should properly bear to any general scheme of railway organization, but when the premises from which he reasons are so manifestly faulty, as in the present case, the logical structure which he rears falls of its own weight, and leaves nothing more to be said.

It is fair to suggest, however, that he should make a closer study of the supply department and secure a more accurate knowledge of its origin, its aims, and its possibilities before reorganizing it out of existence.

AN ORPHAN.

THE DETROIT RIVER TUNNEL.

In a paper presented before the Institute of Civil Engineers of England recently, William J. Wilgus gave a full account of the methods used in the construction of the Michigan Central Railroad tunnel under the Detroit river between Detroit, Mich., and Windsor, Ont. The general features of this work, including the method of construction of the tubes, the excavation of the trench in the bottom of the river, the sinking and concreting of the tubes, as well as the details of the track construction and the type of locomotives used, have been fully described from time to time in the *Railway Age Gazette*. There are, however, a number of items in regard to details of the work and its cost that are brought out by Mr. Wilgus's paper which will be of interest. The following is an abstract of Mr. Wilgus's paper.

THE APPROACH TUNNELS.

In the construction of the approach tunnels the contractor originally intended to excavate, with the exception of the cut and cover portions, by means of a four-story drift for the center wall and a three-story drift for each side wall, after which the inverts and arches were to follow, all with temporary timber lining and without the use of air.

On the Detroit side, westward from the permanent shaft, the harder nature of the clay permitted the use of this method for the center drift for a distance of approximately 1,360 linear ft. Compressed air, at pressures ranging from 5 lbs. to 22 lbs., and averaging 7 lbs. per sq. in., was used for a short distance (400 ft.) near the eastern end, for the prevention of undue surface settlement.

On the Canadian side, after the lower level and a part of the second level of the center drift had been completed for the larger portion of the distance between the permanent shaft and the 3,080-ft. shaft, the pressure of the clay became so great as to crush and distort the timber lining, making desirable the use of a hydraulically-driven shield, which was pushed forward on top of the concrete already laid in the lower level of the drift.

The center shield started from the temporary 3,080-ft. shaft at the west end of the cut-and-cover section, and was driven westward for a distance of 2,013 ft., beyond which, for 1,061 ft., the original method of drifting was employed as far as the permanent shaft. Considerable difficulty was experienced with this type of shield, because of its light construction and a tendency to work out of line, the latter trouble being aggravated by the necessity of chopping away portions of the previously-constructed timber drift.

The high pressure that developed as the excavation progressed, and the surface settlement that followed excessive inflow at the faces of the headings, led to the abandonment, in March, 1907, of the original method of constructing the side walls, inverts and arches, and the adoption in both approaches of hydraulically-driven side shields, guided and partially supported by the previously-constructed center walls, in which channel-bars had been inserted for that purpose.

In the Canadian approach the side shields were started from the same shaft as the center shields, and used continuously for 3,052 ft. to a connection with the short section constructed by

TABLE 1.—APPROXIMATE TUNNEL QUANTITIES AND COSTS, EXCLUSIVE OF CONTRACTOR'S PROFITS.
(Electrification, Tracks, Safety Devices, Terminals, and Right-of-Way not included.)

			Western Open Cut.			Western Approach.			Subaqueous.		
	Items.	Unit.	Quantity.	Unit Cost.[1]	Cost.	Quantity.	Unit Cost.[1]	Cost.	Quantity.	Unit Cost.[1]	Cost.
1.	Excavation	Cubic yard	39,300	$1.33	$52,304	109,500	$4.73	$518,261	350,000	$0.50	$175,950
2.	Iron and steel	Tons	.....	....	3,075	98	92.23	9,039	5,520	136.45	753,065[2]
3.	Concrete A (1:2:4)	Cubic yard	260	11.45	2,977	27,557	10.11	278,494	27,170	12.74	345,978
4.	Concrete B	Cubic yard	5,210	6.97	36,288	12,091	8.54	103,400	79,100	4.42	349,830
5.	Concrete D	Cubic yard	4,597	5.28	24,253	.....	....	.....	21,000	3.72	78,049
6.	Waterproofing	100 square feet	248	2.00	494	2,741	14.62	40,064	.....	....	.....
7.	Ducts	Linear feet	26,004	0.187	4,864	121,956	0.131	15,957	178,124	0.097	17,349
8.	Miscellaneous	.....	.....	....	163	.....	....	5,750	.....	....	52,223[3]
9.	Totals	Linear feet, single track	3,080	....	$124,418	4,264	$227.71	$970,965	5,334	$332.29	$1,772,444

[1]Unit costs obtained by dividing total costs by quantities, and are therefore approximate.
[2]Includes plank sides.
[3]Includes coffer-dam for making westerly connections with approach-tunnel.

TABLE 1.—CONTINUED.

Items.	Unit.	Eastern Approach. Quantity.	Unit Cost.[1]	Cost.	Eastern Open Cut. Quantity.	Unit Cost.[1]	Cost.	Totals. Quantity.	Cost.
1. Excavation	Cubic yard	186,000	$5.54	$1,030,927	163,700	$0.393	$64.400	848,500	$1,841,842
2. Iron and steel	Tons	129	131.20	16,941	.....	....	1,983	5,745	784,103
3. Concrete A (1:2:4)	Cubic yard	51,353	10.08	517,396	75	9.04	678	106,415	1,145,523
4. Concrete B	Cubic yard	14,507	9.40	136,504	2,490	6.17	15,368	113,398	641,390
5. Concrete D	Cubic yard	.....	.....	.....	2,350	4.75	11,164	27,947	113,466
6. Waterproofing	100 square feet	4,463	11.38	50,716	110	1.18	130	7,562	91,404
7. Ducts	Linear feet	205,175	0.141	29,034	7,040	0.132	928	538,299	68,132
8. Miscellaneous	.....	.....	.....	19,985	.....	....	11,325	.....	89,446
9. Totals	Linear feet, single track.	7,022	$256.55	$1,801,503	5,884	....	$105,976	25,584	$4,775,306

[1]Unit costs obtained by dividing total costs by quantities, and are therefore approximate.

the original drift method eastward from the permanent shaft. Compressed air, at pressures varying from 6 to 20 lbs. and averaging 11 lbs. per sq. in., was required for the entire distance.

In the United States approach the side shields were started at different points and pushed eastward to the permanent shaft, the distances for the north and south tunnels being 1,606 ft. and 1,166 ft., respectively. No compressed air was required on this side of the river, except for the short distance in the center drift, as already mentioned.

In the cut-and-cover sections on the Canadian side the eastern 382 ft. of the approach-tunnel was constructed by the ordinary cut-and-cover method. On the Detroit side the same method was used at the western end for 436 ft. and 714 ft. on the north and south tunnels, respectively. About 200 ft. of the southern track east of the cut-and-cover section was built according to the original plan.

RIVER SECTION.

The subaqueous connections between the shore approaches and the subaqueous tunnel were treated differently on the two

TABLE 2.—DETAILED COSTS OF CONCRETE PER CUBIC YARD.

Class of Concrete.	Subdivision.	Western Open Cut. Dollars.		Western Approach. Dollars.		Subaqueous. Dollars.		Eastern Approach. Dollars.		Eastern Open Cut. Dollars.	
A	Concrete: Labor	4.26		2.57		5.63		2.74		3.45	
	Concrete: Material	3.05		3.92		4.33		3.84		3.52	
	Concrete: Overhead charges	1.09		0.98		1.50		0.99		1.04	
	Concrete		8.40		7.47		11.46		7.57		8.01
1:2:4	Forms		3.05		2.64		1.28		2.51		1.03
	Total		11.45		10.11		12.74		10.08		9.04
B	Concrete: Labor	1.50		2.82		0.85		2.94		0.81	
	Concrete: Material	2.80		3.39		2.99		3.71		3.14	
	Concrete: Overhead charges	0.62		0.93		0.58		1.00		0.59	
	Concrete		4.92		7.14		4.42		7.65		4.54
1:3:6	Forms		2.05		1.40		....		1.75		1.63
	Total		6.97		8.54		4.42		9.40		6.17
D	Concrete: Labor	1.65		....		0.73		....		0.68	
	Concrete: Material	2.48		....		2.50		....		3.22	
	Concrete: Overhead charges	0.62		....		0.49		....		0.58	
	Concrete		4.75		....		3.72		....		4.48
1:4:7½	Forms		0.53		....		....		....		0.27
	Total		5.28		....		3.72		....		4.75

Considerable difficulty was experienced in the driving of the side shields, because of light construction that necessitated frequent repairs and strengthening, and the inexperience of the

TABLE 3.—PROPORTIONATE LABOR, MATERIAL AND OVERHEAD CHARGES.

Location.	Labor.	Material.	Overhead charges (15 per cent.).	Total.
Western open cut	$61,018	$47,174	$16,226	$124,418
Western approach	487,377	356,941	126,647	970,965
Subaqueous	341,820	1,199,435	231,189	1,772,444
Eastern approach	952,666	613,859	234,978	1,801,503
Eastern open cut	45,993	46,163	13,820	105,976
Totals	$1,888,874	$2,263,572	$622,860	$4,775,306

men in regulating the movement so as to maintain alinement. Ultimately these faults were corrected so that progress was quite satisfactory, the average daily movement of each shield being approximately 9 ft.

sides of the river. On the United States side the center drift was completed to the west end of the subaqueous tunnel, and the apron was completed for the west end of Section I. The difficulties encountered led to the use of a coffer-dam 66 ft. long, 104 ft. wide, and 54 ft. deep, which was built between the shore and the west end of the previously-deposited subaqueous section, and the connection as far as the shaft, 53 ft. in length, was then constructed in the dry.

Before lining was started, short 1-in. pipes in the top and bottom, spaced 12 ft. apart, were connected with holes bored in the steel shell, with which connections could be made, after the completion of the lining, for forcing grout into all cavities and spaces between the shell and the exterior concrete, and between the shell and lining. This same procedure was followed in the approach-tunnels to stop leaks in the extrados of the arches. Grouting under a pressure of 75 to 100 lbs. per

TABLE 4.—SUBAQUEOUS TUNNELS: ROUGH COMPARISON OF COSTS PER CUBIC FOOT OF INTERNAL CONTENTS.

Place.	River or Harbor.	Nature of Material.	Method of Construction.	Internal Area of Each Bore. Sq. Ft.	Cost of Tunnel Proper. Per Cubic Foot.	Per Linear Foot, Single Bore.
*Detroit	Detroit River	Soft clay	Trench and tremie (no air)	314	$1.057	$332
			Side shield (no air)	309	0.757	228
			Side shield and compressed air	309	0.853	257
			Average	...	$0.896	$273
*†Sarnia	St. Clair River	Soft clay	Circular shield and compressed air	309	1.08	333
Boston	Harbor	Stiff dry clay	Roof shield and compressed air	395	0.61	241
*New York City	North River	Silt	Circular shield and compressed air	182	1.65	300
New York City	East River	Sand and rock	Circular shield and compressed air	165	2.27	375
New York City	Harlem River	Silt and sand	Trench and compressed air	164	2.38	390

*Contractor's profits or losses not included.
†Constructed about 20 years ago. Costs embrace all expenses between portals.

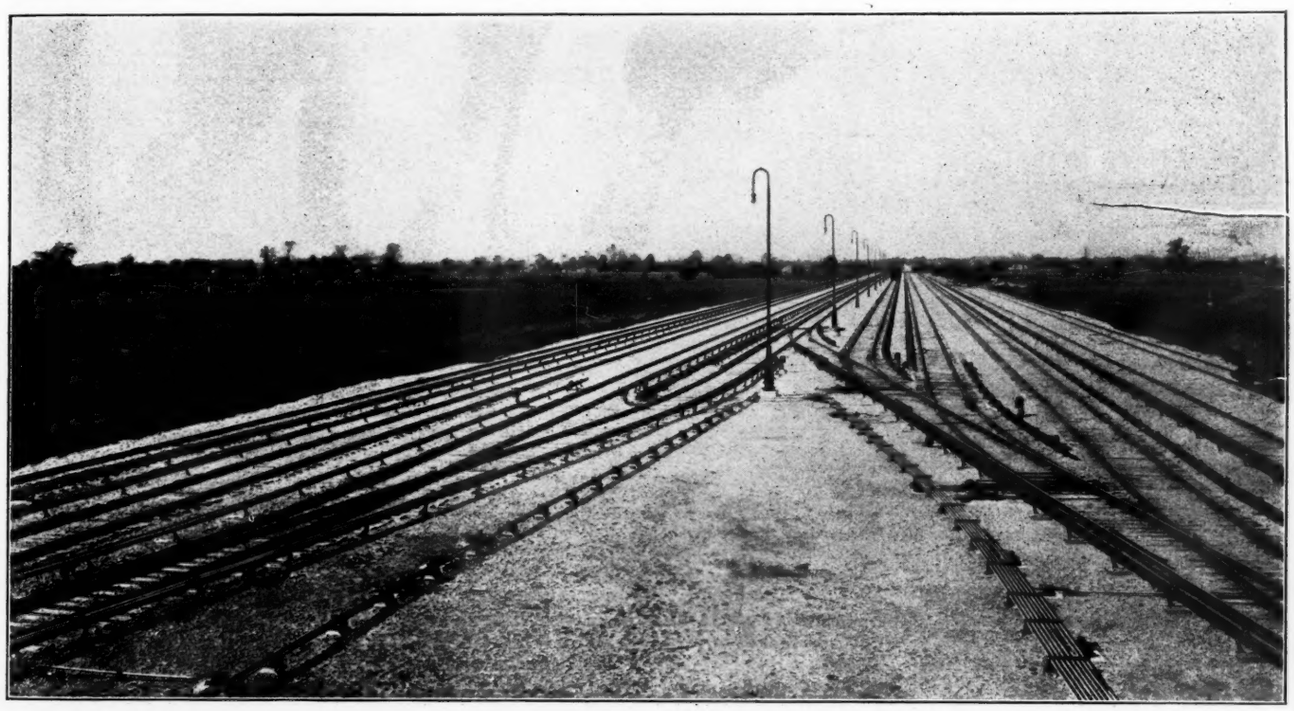
TABLE 5.—COSTS OF TUNNEL PER LINEAR FOOT OF SINGLE TRACK AND PER CUBIC FOOT OF CONTENTS.
(Exclusive of Contractor's Profits.)

Location.	Linear Feet Single Track.	Area Sq. Ft. within Internal Circumference.	Costs per Linear Foot Single Track.									Costs per Cubic Foot within Internal Circumference.
			Excavation.	Iron and Steel.	Concrete, Class A.	Concrete, Class B.	Concrete, Class D.	Waterproofing.	Ducts.	Miscl.	Totals.	
Westerly approach....	4,264	300.8	$121.54	$2.12	$65.31	$24.25	.....	$9.39	$3.74	$1.36	$227.71	$0.757
Subaqueous	5,334	314.16	32.98	*141.18	64.86	65.59	$14.63	.....	3.26	9.79	332.29	1.057
Easterly approach....	7,022	300.8	146.81	2.41	73.68	19.44	.....	7.22	4.13	2.86	256.55	0.853
Total between portals.	16,620	.....	.....	.....	.....	.....	.....	.....	.....	.....	$273.46	$0.896

*Plank sides included.

sq. in. was carried out in the spring of 1910, with the result that the minor leaks that had resulted from imperfect calking and waterproofing were closed, the total leakage between portals in both tunnels being less than 10 gals. per minute, equivalent to 0.85 gals. per day (24 hours) per linear foot of single bore.

While there were on the subaqueous section a number of casualties incidental to the magnitude of the work, such as carelessness of employees and minor accidents, there was not a single fatality attributable to the adopted method of construction, nor, of course, was there any trouble with "bends," as the use of compressed air, except for divers, was avoided.



Windsor Yard; Detroit Tunnel.

COST FIGURES.

The history of an undertaking like the Detroit river tunnel would be incomplete without a statement of costs of the portions of the work that involved the use of new methods. The approximate quantities and actual costs of the tunnel-construction, exclusive of contractor's profits, are given in Table 1, these being taken from inspector's reports, with 15 per cent. added for overhead charges. The total cost from summit to summit will be seen to amount to $4,775,306.

The current prices of labor, tools and material were as follows:

Unskilled labor ..... 15 to 30 cts. per hour; average 18½ cts. per hour.
Skilled labor ..... 25 to 45 cts. per hour; average 32½ cts. per hour.
Cement ..... $1.16 to $2.25 per barrel; average $1.35 per barrel.
Sand and gravel ..... 60 cts. per cubic yard.
Steel in tubes delivered on site of work ..... 5 cts. per pound.
Dredging, based on "pay quantities," with slopes of 1 to 1, beyond which no allowance was made for removed material ..... 40 cts. per cubic yard.
Steam shovels, each ..... $5 per day.
Cars, each ..... $1 per day.
Scows, derricks and miscellaneous tools ..... At prices to cover interest, depreciation and replacement.

It will be noticed in Table 1 that the cost of excavation in the western open cut was $1.33 per cu. yd., as contrasted with 39.3 cts. per cu. yd. in the eastern cut, the difference being due to smaller quantities, a larger proportion of hard digging, and the care required to avoid disturbance of adjoining temporary track-supports at the former place. In the approach-tunnels the use of compressed air on the Canadian side largely accounts for the cost of $5.54 per cu. yd. for excavation as compared with $4.73 on the Detroit side. The subaqueous cost of 50c. per cu. yd. includes dredging, coffer-dam excavation, backfilling, riprap and other work connected with the excavation and refilling of the trench, with the exception of the coffer-dam itself, which is included under "Miscellaneous."

The item of iron and steel appears most prominently in the subaqueous section, where 5,000 tons was required in the tubes and the balance, 528 tons, in grillages and reinforcing rods. The approximate cost of the tubes in places was:

	Net Cost per Ton.
Steel tubes delivered on side ready for sinking	$112.00
Labor of sinking and placing	8.40
Plank sides	6.10
Overhead charges (15 per cent.)	19.00
Total	$145.50

The cost of concrete per cubic yard varied, of course, with the classification and with the conditions under which it was placed,

the cost of forms having much to do with the differences, as will be noted in Table 2.

Class A concrete (1:2:4) was the most uniform in cost, averaging $10.76 per cu. yd., the highest reaching $12.74 per cu. yd. in the subaqueous tunnel-lining where the comparative thinness of the ring and the presence of reinforcing rods increased the labor item. Class B concrete (1:3:6) ranged from $6.17 to $6.97 per cu. yd. in the open-cut retaining walls, and from $8.54 to $9.40 in the approach-tunnels; while in the river section the cost fell to $4.42 per cu. yd., because of the use of tremies and the absence of forms other than the tubes and appurtenances that are provided for under iron and steel. Class D concrete (1:4:7½) cost $4.75 to $5.28 per cu. yd. in the open-cut retaining-walls, and $3.72 per cu. yd. in the foundation-course of the subaqueous sections, where the increase from the calculated quantity, 6,800 cu. yd., to the actual quantity of 21,000 cu. yds., is accounted for by the large amount of "prodding" that was required in the soft clay near mid-channel, as well as for the excess excavation beyond the neat lines of the trench.

A sub-division of the tunnel-costs given in Table 1 into labor, material and overhead charges, appears in Table 3, the items of dredging and steel tubes ready for sinking appearing in subaqueous material, because they were sub-contracted, and therefore their labor costs did not show on the reports of the principal contractor's operations.

It may not be amiss to compare these results with those obtained in subaqueous-tunnel practice elsewhere in the United States, during the past 20 years. For this purpose the cost of the tunnel between portals, per cubic foot of contents within the internal circumference, is of special value in making a comparison of the costs of tunnels having different dimensions. While of course, the comparison shown in Table 4 is of little precise value, owing to differences in local conditions, varying prices of labor and materials, the inclusion in some instances and the omission in others of contractor's profits and losses, and uncertainty as to the strict accuracy of the cost data, still it has considerable interest as indicating in a general way the results obtained in different materials by various methods.

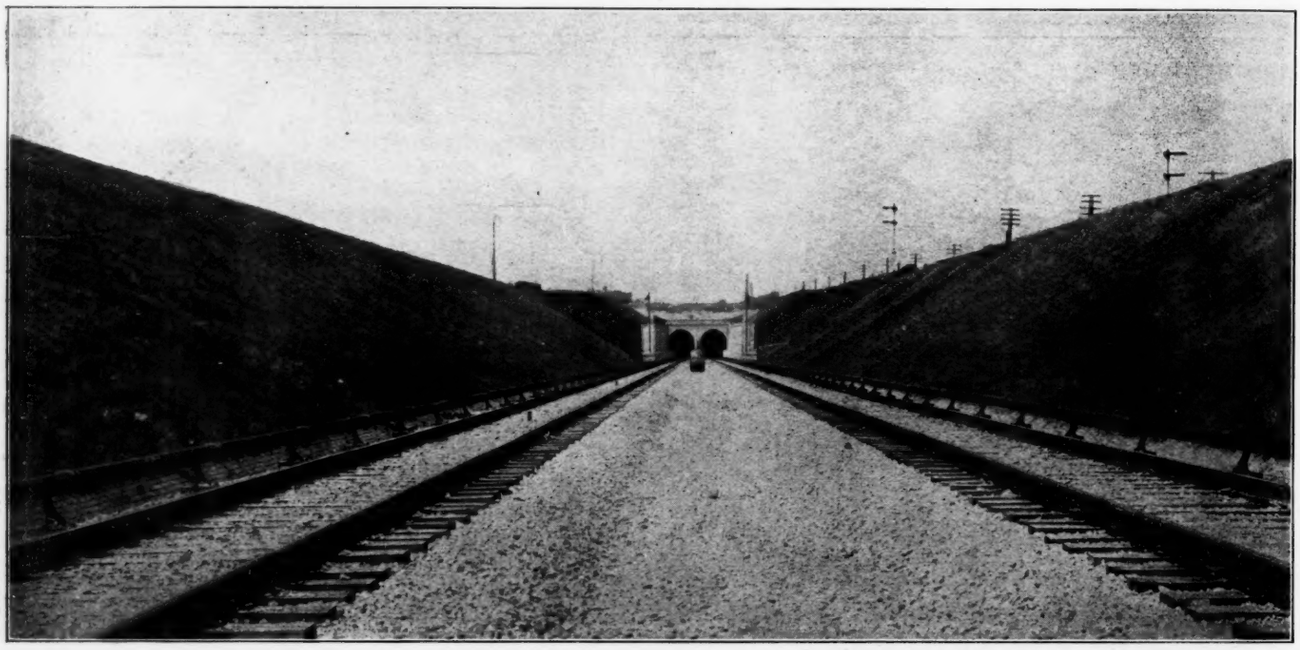
Summarizing, it appears that tunnel costs per cubic foot of contents, within the internal circumference, may be said to have ranged from 90 cts., as at Detroit, to $1.08 and upwards, in soft clay; $2.27 and upwards in sand and rock; from $1.65 to $2.38 in silt; and 61 cts. in firm clay free from water.

The author believes that the subaqueous method used at Detroit may be utilized with marked reduction of cost and hazard, in locations where the employment of shields and compressed air has hitherto been considered obligatory; and where the gradients and proximity of portals to shore-lines make desirable or necessary the raising of the top of the structure up to or above the water-bed.

SIGNALING AND SAFETY DEVICES.

Complete installations of electric automatic signals and electric interlocking plants with alternating current track-circuits were installed by the tunnel company with purchased materials, all devices complying with the requirements of the New York Central Lines for safeguarding traffic.

An independent telephone system for the use of transportation and maintenance employees connects the tunnel substation with portals, shafts, and subaqueous sump, and also with the signal towers near the summits at which sectionalized circuit-breakers are placed.



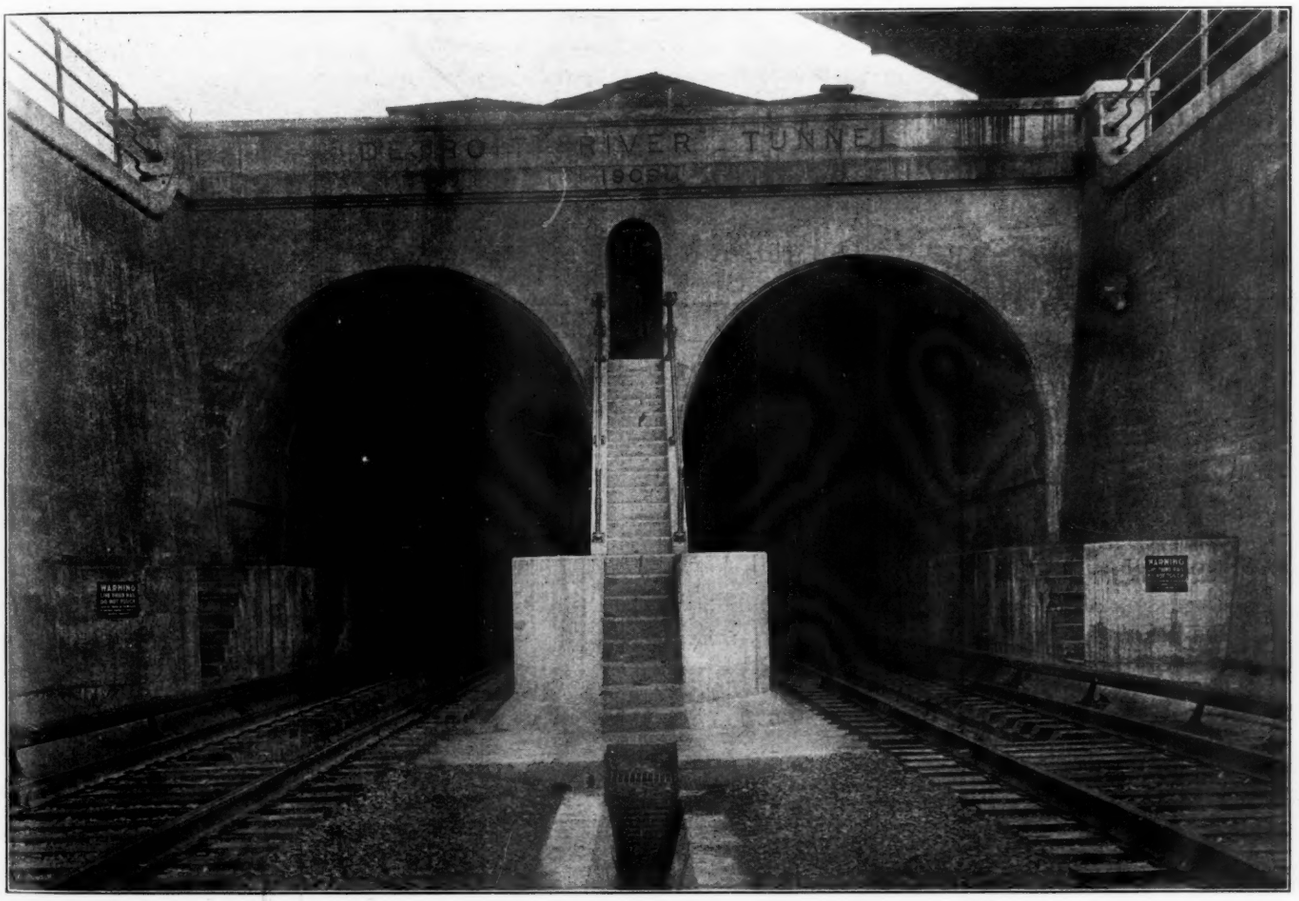
Approach to West Portal of Detroit Tunnel.

The advisory board concluded that provision should be made for the prompt cutting off of propulsion-current, and for a supply of water under pressure, in the event of accidents in the tunnel. In accordance with this policy a continuous "pull-chord" and "break-glass" boxes have been placed in both tunnels, by means of which any passenger or employee may send an alarm to the substation operator, who in turn will cause the fire pump in the substation at once to be started and water under pressure to be supplied through a 5-inch main in each tunnel to hose connections spaced about 100 ft. apart. At the same time the substation operator will notify the men in charge of the signal towers to open the circuit-breakers controlling the affected section and cut off the supply of propulsion-current to the third rail. With these precautions, supplemented by the use of the independent telephone system, it is possible on short notice immediately to interrupt the supply of propulsion-current, secure fire pressure in the pipe lines, and take any other measures that may be required for the comfort and safety of passengers and employees.

An automatic train stop, devised by the author, was installed experimentally to secure, if possible, means by which rear-end collisions, due to carelessness or disability of employees, would

be rendered impossible. The improper passing of a home signal results in the de-energizing of a normally closed air brake magnet on the locomotive, thereby venting the train pipe and causing the brakes to be applied. The de-energizing of the air brake magnet is effected by the automatic cutting off of the supply of propulsion-current to a short movable section of working-conductor at the home signal, when the block ahead is occupied. As the device depends for proper working upon a closed circuit, any defect or injury thereto will result in the application of the brakes.

Artificial ventilation in the tunnel is considered unnecessary, because of the adoption of electricity as a motive power, the access to outer air at shafts and portals, and the running of trains in one direction through single-track tubes acting as pistons to expel foul air in front, and draw in fresh air from the rear.



Detroit Portal.

ELECTRIFICATION.

Electricity as a motive power was adopted at the beginning, and, in fact, it was the recognition of its applicability to steam railway conditions, based on the promised success of the New York Central installation at New York, that led to the decision to construct the tunnel.

The problem to be solved involved the electrifying of the tunnel-zone extending from a point ¾ mile west of the Detroit summit to a point 1¼ mile east of the Canadian summit, a total distance of 4½ miles, and embracing 18 to 20 miles of single track in main line and yards.

The service to be handled, exclusive of future additions from foreign lines, was estimated to consist of twenty freight trains and eighteen passenger-trains daily, the former ranging in weight, exclusive of locomotives, from 1,366 to 1,685 tons, and the latter from 134 to 535 tons. The conditions of operation were assumed to necessitate at times the simultaneous movement on the ascending gradients through the tunnel of a 1,800-ton goods-train in each direction at a speed of 10 miles per hour, plus assumed main-line and yard movements beyond the summits. The number of cars to be moved daily approximates to 1,200, or about 400,000 per annum.

Provision was also required for the working of sump-pumps, and for lighting the tunnel and yards.

The fiercely-asserted rival claims made by the advocates of various methods of electrification rendered imperative the adoption of a means of reducing arguments to some measureable basis that would be equally fair to all, and afford the advisory board justification for selecting an electric propulsion system that would combine safety and reliability with economy.

In compliance with this policy, specifications were prepared, setting forth the physical conditions as to alinement and gradients, the speed, frequency, and weights of both classes of trains, the lighting and pumping, and all other information that would be required by those tendering propositions, to produce the results desired by the tunnel company.

Each tenderer, therefore, was to submit a proposition for a definite scheme to meet these conditions, the design being prepared with a view to cause the tunnel company a minimum amount of expense for meeting the growth of traffic. It was mentioned that if foreign railways used the tunnel route the traffic would be approximately doubled, and the proposed method of providing for this had to be stated. Any tenderer who deemed the requirements of the general specifications prohibitive to the free exercise of his best skill in meeting the conditions was invited to offer suggestions for the consideration of the company.

Attention was called to the clearance provided in the tunnel

above the top of the rail, and notice was given that the cost of enlarging the tunnel to afford additional space for any system involving the use of overhead working-conductors would be considered as a charge against such system in making comparisons with other systems not requiring enlargement.

As the annual cost of operation should have equal consideration with first cost in determining which system was to be adopted, tenderers were required to insert in the specifications their estimate of the annual costs, both fixed charges and working expenses, of the system upon which they tendered, whether direct-current, single or three-phase alternating-current, or any other system that they considered properly adapted to the conditions. In order that the tenders might be properly compared, the cost of maintenance and operation was to be calculated in accordance with a specified method, and before the contract was finally awarded, a form of guarantee was required, protecting the tunnel company against a higher cost of maintenance and operation. These annual costs comprised interest charges, taxes, insurance, risks, depreciation, operation and maintenance.

Other clauses of the specifications described in detail the general requirements applicable to any or all systems, among the principal items being the power station and substation buildings and machinery, the duct-system, cables, working-conductors, track-bonds, lighting, locomotives, and pumps. As a rule, the specifications in force for the electric-zone improvements of the New York Central at New York governed the workmanship and material.

Invitations to contractors were issued on March 1, 1906, and on August 15 of the same year proposals were received from three companies, a comparison of which is presented in Table 6. It was therefore apparent that for this particular problem direct current was respectively 12 per cent. and 32 per cent. less expensive in first cost than the three-phase and single-phase system, and 4 per cent. and 20 per cent. less expensive annually, apart from the avoidance of necessity for encroaching on tunnel-clearances. The adoption of the single-phase system in this instance would have imposed upon the tunnel company an added burden of nearly $40,000 per annum.

Table 6.—Comparison of Costs of Three Types of Electric Installations.

		Locomotives for Specified Service.		*Comparison of Costs, Omitting Batteries.				
				First Costs.				Annual Costs. Including Fixed Charges, Operation and Maintenance.
System.	No.	Weight each. Tons.	Aggregate Weight. Tons.	Gen. Station.	Distr. System.	Locos.	Total.	
Direct current..	8	89¼	714	100	100	100	100	100
Three-phase† ..	8	72¼	578	96	167	103	112	104
Single-phase†...	16	53½	856	121	104	167	132	120

*Traction only. Direct-current costs, 100 assumed as basis for comparison.
†In making this comparison of cost no charge has been made for the enlargement of the tunnel if found necessary for overhead conductors.

Moreover, the advisory board considered that direct current possessed elements of greater reliability, this feature being emphasized by the demand of the operating department of the railway company for the installation of storage batteries as a reserve in case of power-interruption.

POWER SUPPLY.

A careful consideration of the subject led to the decision that the best interests of the company would be served by the purchase of power from the Detroit Edison Company, which, with its multiplicity of generating plants, offered a favorable price and a reliability of supply that could not be guaranteed with an isolated station of the tunnel company.

The use of a storage battery by the tunnel company was imposed in order to ensure reliability of service and for regulating the short periodic fluctuations of demand for primary alternating current for traction purposes to within 300 kilowatts above and below the capacity agreed upon from time to time.

The substation building, covering a space 50 ft. by 207 ft., and suitably arranged for the installation of motor-generators, booster and battery, together with the fire-pump and appurtenances, was constructed near the Detroit shaft, down which ducts were provided for the thirty-two cables of the distributing and telephone systems. Two motor-generators, each with a capacity of 1,000 kilowatts, are installed, with space for a third; these transform the 4,400-volt alternating current to 650 volts direct current for the track. The battery consists of 312 cells, and has a capacity of 1,500 kilowatts on an hourly rating; it was supplied under a maintenance agreement for a long time-period at a fixed annual cost.

The 650-volt third-rail working-conductor is of the under-running protected type devised by the author in collaboration with Frank J. Sprague, and was first used on the New York Central. In this type the 70-lb. bull-head steel rail is clasped in porcelain insulators made in two halves and fastened to cast-iron brackets spaced 11 ft. apart. Between the insulators the rail is sheathed in a wooden insulated covering so that only the lower surface is exposed to contact, thus guarding against accidents to employees and interruption of service from sleet and snow. This covering is in three pieces, the lower two pieces being fixed to the upper by long screws when in place.

West Bound Approach Tunnel.

LIGHTING AND PUMPS.

The contract for lighting included the furnishing and installation of all parts necessary for lighting the tunnel and yards. Duplicate lines of lighting in each tunnel are supplied from an independent 4,400 volt alternating circuit so as to be unaffected by interruptions of propulsion-current, the 16 candle power lamps being spaced 40 ft. apart on each line. One hundred and twenty-four series arc-lights on steel poles were installed by the tunnel company in the yards and tunnel open cuts.

Automatically-controlled motor-driven sump-pumps of the submerged vertical centrifugal type were installed. Particulars of their situation and other data appear in Table 7.

Table 7.—Capacity of Sump Pumps.

	Aggregate Capacity. Gals. per Minute.	Capacity of Sump. Gals.	Gravity Head. Feet.	Outlet.
Detroit portal	1,400	43,000	29	City sewer
Detroit shaft	700	20,000	69	River
Mid-river sump....	500	37,000	91	River
Windsor shaft	700	20,000	87	River
Windsor portal....	4,500	53,400	40	Tunnel Company's sewer

To facilitate the change of locomotives from steam to elec-

tric, and *vice versa,* ample yard facilities have been provided beyond the tunnel-summits on both sides of the river. Eastbound passenger trains on the Detroit side proceed under steam to the existing station near the water front, thence back to the yard at the junction with the tunnel line near the summit, where the motive power is changed to electricity, and thence they proceed to the Windsor yard, where steam locomotives are again attached. Westbound passenger trains drop their steam locomotives at the interchange yard at Windsor and proceed by electricity to the Detroit yard, where the change is made to steam and the train is backed into the station.

Freight trains are handled in the same manner as the passenger service, excluding, of course, the back movements at the joint station.

When the new joint station at the western summit is completed back movements will be obviated, and the change of motive power of passenger trains will be made at the station while the loading and unloading of passengers, luggage, mails and parcels, are being effected.

As Detroit is a division point, necessitating an exchange of locomotives on all trains from both the East and the West, the use of electricity in the tunnel imposes but one extra change of power, the average time required, for which is between 4 and 5 minutes per train.

The saving in time that results from the use of the new method of crossing the river, as compared with car-ferriage, averages 15 to 20 minutes for passenger trains and 3 to 4 hours for freight trains, without taking into consideration the elimination of the absolute stoppage of traffic that formerly occurred in winter months when running ice was particularly heavy.

On July 26, 1910, not quite four years after ground was first broken, the initial electric train passed through the tunnel, the fruit of 50 years of endeavor to conquer nature's obstacle to a continuous rail connection between the east and the west, via Detroit.

From this improvement, costing with contiguous work between $10,000,000 and $15,000,000, the public will reap the benefits of greater safety, reliability and speed that will result from the substitution of an electrically operated tunnel for the uncertainties and dangers incident to car ferriage across a pathway encumbered in summer and autumn with a traffic of more than 60,000,000 tons annually, and rendered hazardous in winter by storms and ice. The railway in turn will profit by savings in time and cost of working, and in a larger sense, from the increase of traffic that will inevitably follow growth of public favor, and the removal of a handicap to competition for trunk-line traffic.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.

The fourth annual convention of the Association of Railway Electrical Engineers was opened Tuesday, November 7, at the La Salle Hotel, Chicago, with a brief address by the president, J. R. Sloan, general electrician of the Pennsylvania Railroad. Mr. Sloan referred to the important work which is now being done by the United States Bureau of Standards in co-operation with the Pennsylvania Railroad, on specifications for incandescent lamps.

About 120 members registered, and the secretary, Joseph Andreucetti, reported a total membership, regular, junior and honorary, of 551.

Under unfinished business a communication was read from the American Institute of Electrical Engineers, requesting the Association of Railway Electrical Engineers to send a petition to the president of the United States asking for the appointment of a permanent commission to deal with improvements in patent laws. The meeting decided to send to the president a resolution similar to that prepared by the Institute of Electrical Engineers.

Under the same order of business was read another communication from the Institute of Electrical Engineers, relating to the terminology used in defining electric conductors, wires and cables, it was decided to accept the terminology suggested by that association, and the proposed definitions were referred to a committee on specifications.

Under new business was presented a report of a committee relating to revision of the constitution and by-laws. The principal item related to the number of votes which various classes of members should be entitled to, and it was proposed that in the adoption of standards a representative member should have a number of votes equal to one-tenth of the number of electric lighted cars owned by the company which he represented. This was referred to a committee.

At the afternoon meeting on Tuesday there was presented a report of the committee on data and information, by F. E. Hutchinson, chairman. This report contained valuable data relating especially to car lighting. It included some statistics regarding axle lighting belts, showing why belts are lost. It stated that the number lost due to careless application was 28 per cent.; to the dynamo being out of line, 24 per cent.; to poor inspection, 22 per cent.; to striking brake beams, 11 per cent.; and to miscellaneous causes, 15 per cent. Belts are invariably broken at the clamps or rivets, showing the necessity for a better fastening for belts used in this service and for more careful instruction of the men who apply them. The report contained figures relating to electric car lighting in the United States, which showed that there are now over 11,000 cars so equipped out of a total number of about 50,000 passenger cars. Of the electric lighted cars 1,372 use straight storage; 3,185, the head end system; 5,900, the axle system; and the number of cells in the batteries used for train lighting is 202,744. The report estimates the cost of equipping a locomotive with an electric headlight and cab lights, exclusive of the dynamo, to be $28.

At the same session on Tuesday there was presented a report of the committee on ventilation, E. M. Cutting, chairman. This report refers to the two systems in use on passenger cars—the natural system, which makes use of the movement of the train to force some of the outside air into the cars, including that which exhausts air from the top of the cars where the incoming air is first passed over heating coils; and the artificial system, which employs fans to drive air into the car and to force it out; the latter possessing some advantages, as it does not depend on the motion of the train for its successful operation. The report describes the Pennsylvania Railroad system of car ventilation and gives an abstract of the paper on the ventilation of Pullman cars by Dr. Crowder, which we have already published. It appears from Dr. Crowder's exhaustive study of the ventilation of sleeping cars that the present situation is marked improvement over that existing before the application of exhaust ventilators, and that if there is any discomfort it is more probably due to the phenomenon known as heat stagnation than to an excessive amount of carbonic acid in the air of the car. It has been demonstrated that the absence of appreciable air currents is responsible for much of the discomfort in passenger cars, and it would appear necessary, in addition to providing adequate exhaust and intakes, to install fans which will furnish air currents to penetrate or break up the aerial envelope which surrounds the human body, thus relieving the sensation of stuffiness or closeness.

On Wednesday morning there was presented a report of the committee on standards, D. J. Cartwright, chairman. This stated that no official action has been taken on any of the recommendations of the various committees on standards, owing to the fact that the value of a representative senior active member's vote has not been officially determined. The question was referred to the executive committee at the last annual meeting, and the decision of that committee appears as a proposed amendment to the constitution. The recommendation of the M. C. B. committee on train lighting was submitted to letter ballot and was rejected. Through an oversight the report was voted on as a whole and not by sections. The committee, therefore, presented again a number of recommendations for standard practice relating to car lighting.

The report of the committee on Improvements was presented

by H. C. Meloy, chairman. This was an interesting report and covers various improvements relating to apparatus used by the railways which have been brought out since October, 1910. These are described under the following classifications: Axle lighting equipment; storage batteries; lamps, shades and fixtures; fans; motors and generators; controlling devices; wires and wiring devices; transformers and rectifiers, and instruments. The report includes special articles which have been prepared by the different electric manufacturing and supply companies relating to their recent improvements. One of the most interesting is that on the use of forced ventilation on car motors which has been tried on a large scale on the Pennsylvania's Long Island Railroad cars. The used of forced ventilation enables the motors to be operated at a much higher continuous rate than would be possible without it.

At the afternoon session on Wednesday there was presented a report of the committee on shop practice, by C. J. Causland, chairman, and we publish in this issue a liberal abstract of the report. The session on Wednesday concluded with a paper on insulation, by K. R. Sternberg.

The further programme of the convention includes the report of the committee on specifications, a paper on The Light for Safety, by F. R. Fortune, and reports of the committees on train lighting practice and on illumination. The programme for the last day includes routine business and election of officers, closing with a paper on Industrial Trucks, by T. V. Buckwalter. A further report of the convention will be published in a later issue.

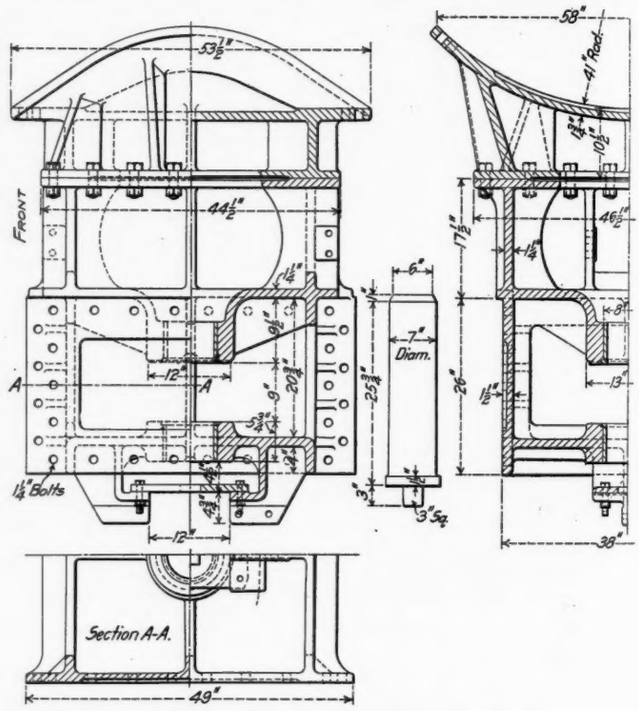
Among the exhibits were the following:

Adams-Bagnall Company, Cleveland, Ohio.—A-Bolite flaming arc lamps, train ventilating fans.
Adams & Westlake Company, Chicago.—Train lighting fixtures.
American Pulley Company, Philadelphia, Pa.—Pulleys and bushings.
Benjamin Electric Manufacturing Company, Chicago.—Arc lights and train lights.
Central Electric Company, Chicago.—Okonite Wire and products, D. & W. material, Invincible renovator, Diehl car fans, Columbia train lamps.
Consolidated Railway Electric Light & Equipment Company, New York.—Generating sets, circuit breakers and train lighting system.
Crouse-Hinds Company, Chicago.—Full line of condulets and panel boards.
Cutler Electric & Manufacturing Company, Philadelphia, Pa.—I. T. E. circuit breakers, 4-panel board, remote control.
Edison Storage Battery Company, Orange.—Edison storage batteries for train lighting.
Electric Storage Battery Company, Philadelphia, Pa.—Storage batteries for train lighting.
General Electric Company, Schenectady, N. Y.—Generating sets, dynamos, train lighting turbine parts, circuit breakers, fans and mercury arc rectifiers.
Gould Storage Battery Company, Depew, N. Y.—Generating sets, Gould storage batteries, switchboard and control.
Holophane Company, Newark, Ohio.—Full line of reflectors.
Jefferson Glass Company, Follansbee, W. Va.—Lighting glassware.
Kerite Insulated Wire & Cable Company, New York.—Full line of Kerite wire and cable.
J. Lang Electric Company, Chicago.—Panel boards and Lang induction motor.
National Electric Lamp Company, Inc., Cleveland, Ohio.—Headlight lamps and train lighting lamps.
New York Leather Belting Company, New York.—Leather belting.
Niagara Lead Battery Company, Niagara Falls, N. Y.—Train lighting, storage batteries and signal storage batteries.
Nungesser Carbon & Battery Company, Cleveland, Ohio.—Carbon specialties and full line of dry batteries.
Oneida Steel Pulley Company, Oneida, N. Y.—Pulleys and shafting.
Pass & Seymour Company, Inc., Chicago.—Special porcelain sockets and full line of sockets.
Pyle-National Electric Headlight Company, Chicago.—Pyle-National headlight and complete plant.
Safety Car Heating & Lighting Company, New York.—Generating sets, gas sets and train lighting fixtures.
Sangamo Electric Company, Springfield, Ill.—Switchboard, watt-hour meters and meters of various kinds.
United States Light & Heating Company, New York.—National storage battery for car lighting, axle generators, regulating panels, lamp regulators and assortment of spare parts.
Western Electric Company, Chicago.—Interphones and train lighting lamps.
Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa.—Lights and lighting specialties.
Willard Storage Battery Company, Cleveland, Ohio.—Storage batteries for train lighting.

The government of Peru has entered into a contract with the Arthur Koppel Company, Berlin, to build the first section of the Paita-Maranon Railway. The approximate cost of this work is estimated to be $5,000,000, to be met by the issue of 6 per cent. government bonds.

MALLET LOCOMOTIVES FOR THE SOUTHERN PACIFIC.

The Southern Pacific Company recently received twelve Mallet locomotives from the Baldwin Locomotive Works, Philadelphia, Pa., which will be used in passenger service on the Sacramento division of the Central Pacific. Eastbound there is a continuous ascending grade from Sacramento, Cal., to Summit, a distance of 105 miles. The total rise is 7,000 ft., and the maximum grade is 116 ft. per mile for about 40 miles. Since 1907 the passenger service on this division has been handled by ten-wheel locomotives built to the Associated Lines standards. They weigh 203,000 lbs., and have 160,000 lbs. on the driving wheels. The tractive effort is 34,700 lbs., and two engines are required to handle a 500-ton train on the 116-ft. grade. Each of the new Mallet locomotives will replace two of the ten-wheel engines and under ordinary conditions, the double heading of passenger trains will be avoided. The general design of the new locomotives follow that of the Mallet freight locomotives with 2-8-8-2 wheel arrangement, which were described in the *Railway Age Gazette*, April 30, 1909, page 933, and have

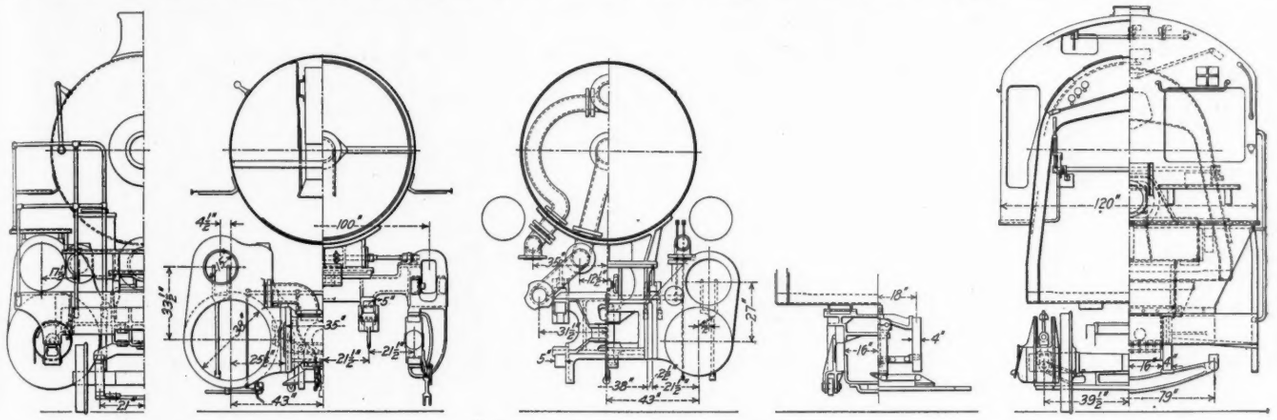


Cast Steel Saddle for Mallet Locomotive.

been in successful use on this division since 1909. A number of modifications have been introduced, however, and these include some features which are new to the practice of the builders.

The boilers of the new Mallet engines are of the separable type, with the dome placed a short distance ahead of the firebox. An internal dry pipe conveys the steam from the dome to the intermediate combustion chamber. This chamber contains right and left hand steam pipes of the ordinary construction, which communicate with short horizontal pipes leading to the high pressure steam chests. The high pressure exhaust is conveyed to the smoke-box through a horizontal pipe located in a large flue which traverses the feedwater heater, and is carried to the flexible receiver pipe. The injector piping is arranged so that the feedwater enters the heater on the bottom center line and leaves it on the top center, thus causing the water to circulate through the entire heater. The hot water enters the boiler proper on both sides, at a distance of 35 in. from the front tube sheet. Check valves are placed at both the heater and the boiler inlets.

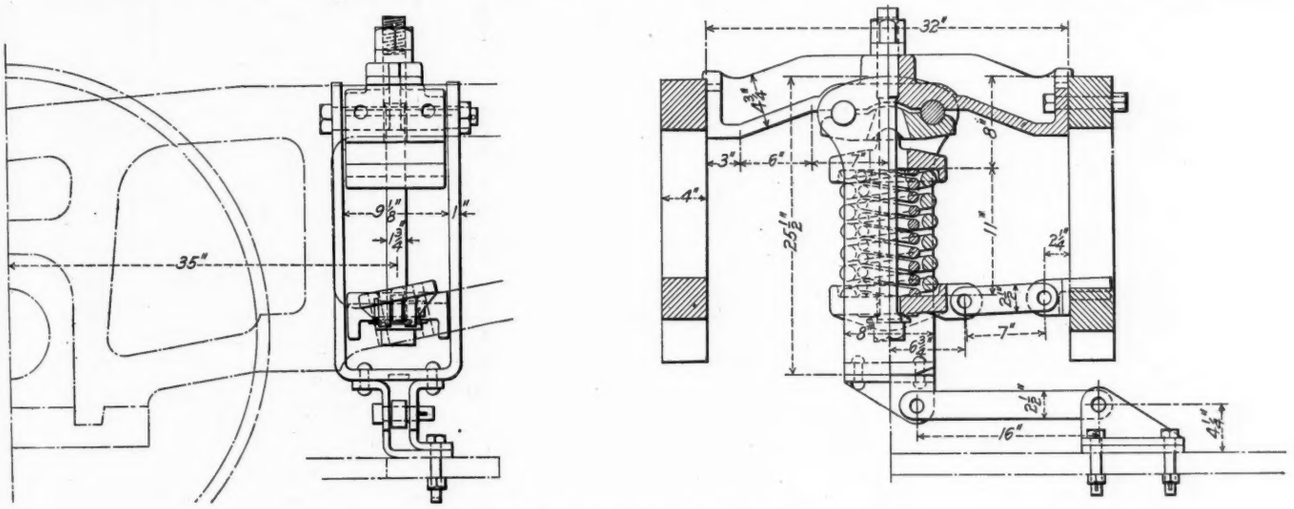
The steam distribution to all cylinders is controlled by inside admission piston valves, which are of the built-up type 15 in. in diameter. The valves are operated by the Walschaert valve gear, and are set with a lead of 5/16 in. The exhaust



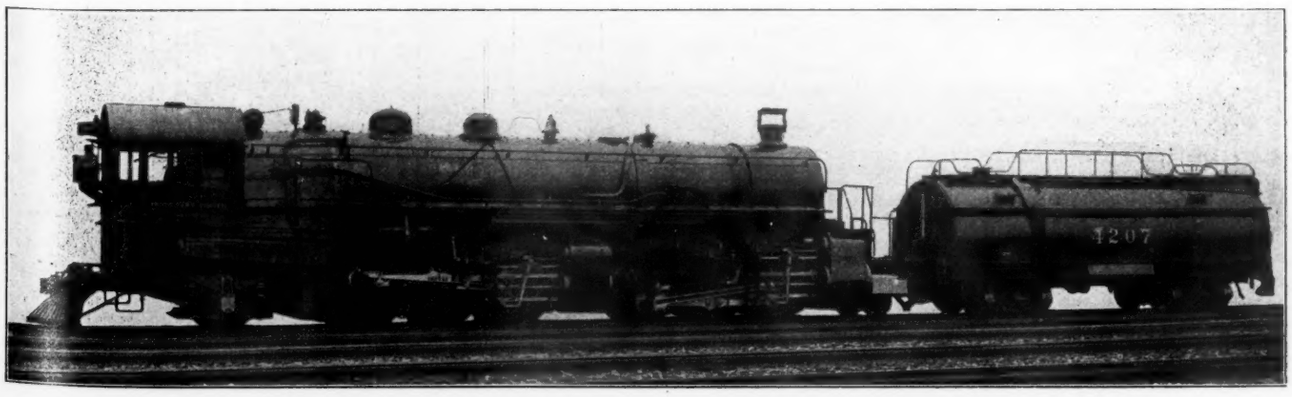
Sections of Mallet Locomotive.

clearance of the high pressure valves is ¼ in., and of the low pressure ⅜ in. No by-pass valves are used, but a large relief valve is tapped into the steam pipe leading to each cylinder. Special attention has been given to the steam distribution, and to providing ample sectional areas in the steam and exhaust piping. The low pressure pistons have extension rods which are supported on crossheads at their outer ends, the guides for these crossheads being carried by the cylinder heads and the cast steel bumper beam. The crossheads have cast steel bodies and bronze gibs, and these bear on the tops of the guides only.

The high pressure cylinders are secured to the saddle by a slab frame 26 in. deep and 2½ in. wide, which is interposed between them. This slab is spliced to the main frame by 21 bolts 1½ in. in diameter, and by two vertical keys, driven in a parallel key-way, with their tapered faces in contact. The same plan is used for keying the frames to the cylinders and saddle. The saddle itself is of cast steel, and is composed of two sections. The lower section extends the full depth of the slab frames, and supports the hinge pin, which is 7 in. in diameter. With this arrangement the separate crosstie heretofore used to support the lower end of the hinge pin is combined with the saddle casting and the cylinders, frames and saddle are



Centering Device for Trailing Truck.



Mallet Passenger Locomotive with Cab at Leading End; Southern Pacific.

bolted and keyed together to form a strong and rigid structure. The low pressure cylinders are bolted directly to a steel box-casting which is secured to the frames.

These engines are designed to run firebox end first to give the enginemen an unobstructed view of the track. The truck under the firebox therefore becomes the leading truck. It is of the Hodges type, and has spring links jointed so as to allow a fore-and-aft motion, as well as a lateral motion. A new design of centering device is applied to this truck. It consists of a double coil centering spring that is held in a vertical position between two cast steel washers, and is guided by a vertical thrust bar. This thrust bar is placed on the center line of the locomotive and is suspended from a crosstie. The upper spring washer bears on the crosstie, through two 2-in. pins and a bearing plate. On these pins is suspended a U-shaped strap, which is wide enough to embrace the spring washers. A link connects the lower end of the strap with a lug which is bolted to the truck frame. When the frame is displaced from its middle position, the strap is pulled to one side, and one of the upper pins is drawn down, thus pushing on the bearing plate and throwing the spring into compression. The bottom spring washer is held in place by a link which is pinned to the engine frame.

These locomotives are equipped for burning oil, and the tenders are coupled at the smoke-box end. The two tanks are semi-cylindrical in shape, and are placed end to end. The tender frame is composed of 12-in. channels weighing 40 lbs. per foot, and braced transversely. The end bumpers are of cast steel. The tender trucks and the trailing truck, are equipped with Standard forged and rolled steel wheels. A table of the important dimensions and ratios follows:

General Data.

Type	2-6-6-2
Service	Passenger
Fuel	Oil
Tractive effort	66,800 lbs.
Weight in working order	384,800 lbs.
Weight on drivers	320,100 lbs.
Weight of engine and tender in working order	568,000 lbs.
Wheel base, driving	32 ft.
Wheel base, rigid	11 ft.
Wheel base, total	51 ft. 4 in.
Wheel base, engine and tender	85 ft. 1 in.

Ratios.

Total weight ÷ tractive effort	5.76
Weight on drivers ÷ tractive effort	4.80
Tractive effort × diam. drivers ÷ heating surface	591.
Total heating surface ÷ grate area	101.7
Firebox heating surface ÷ total heating surface, per cent.	3.3
Weight on drivers ÷ total heating surface	45.
Total weight ÷ total heating surface	54.
Volume of equivalent simple cylinders, cu. ft.	22.5
Total heating surface ÷ vol. cylinders	316.
Grate area ÷ vol. cylinders	3.11

Cylinders.

Kind	Compound
Diameter	25 in. and 38 in.
Stroke	28 in.

Valves.

Kind	Bal. piston
Diameter	15 in.
Lead, forward gear	5/16 in.

Wheels.

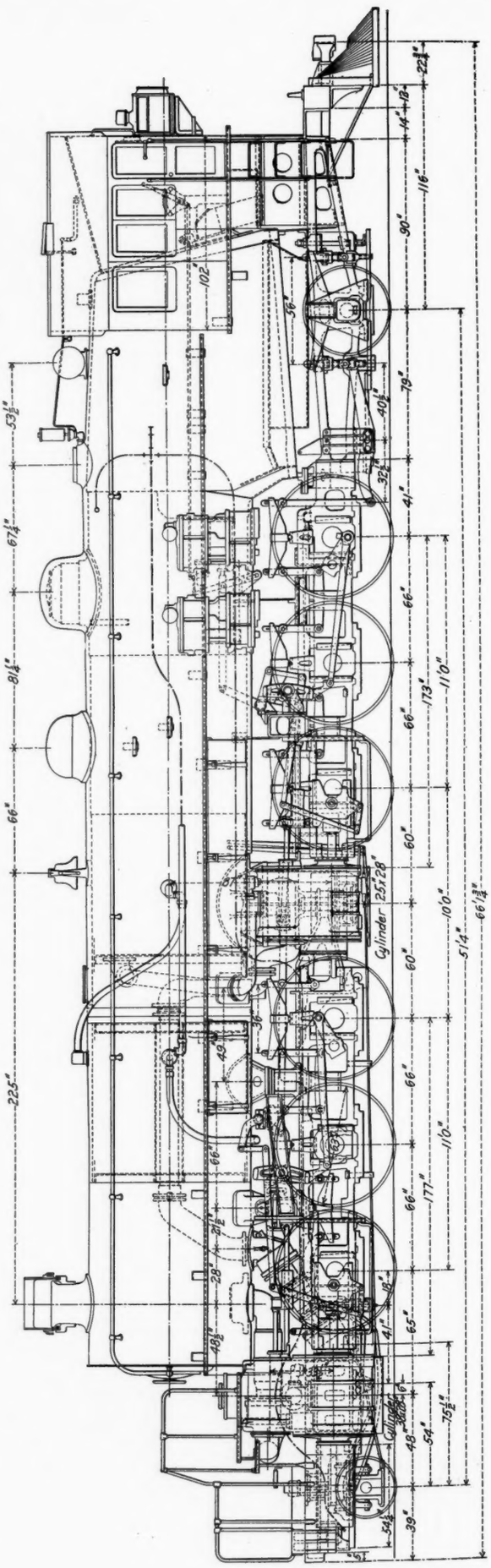
Driving, diameter over tire	63 in.
Driving, thickness of tire	3½ in.
Driving journals, main, diam.	11 in. x 12 in.
Driving journals, others, diam.	10 in. x 12 in.
Engine truck, diameter	30½ in.
Engine truck journals	6 in. x 10 in.
Trailing truck, diameter	45 in.
Trailing truck journals	8 in. x 14 in.

Boiler.

Style	Straight
Working pressure	200 lbs.
Outside diameter of first ring	82 in.
Firebox, width and length	84 in. x 120 in.
Firebox plates, thickness	⅜ in.
Firebox water space	5 in.
Tubes, number and diameter	495—2 in.
Tubes, number and diameter (feed-water heater)	424—2¼ in.
Tubes, length	20 ft. 6 in.
Tubes, length (feed-water heater)	6 ft. 3 in.
Heating surface, tubes	5,292 sq. ft.
Heating surface, firebox	235 sq. ft.
Heating surface, feed-water tubes	1,590 sq. ft.
Heating surface, total	7,117 sq. ft.
Grate area	70 sq. ft.

Tender.

Wheels, diameter	33 in.
Journals	6 in. x 11 in.
Water capacity	10,000 gals.
Oil capacity	3,200 gals.



Oil Burning Mallet Passenger Locomotive; Southern Pacific.

ELECTRIC POWER FOR RAILWAY SHOPS.*

There are three systems of generating current for operating shop machinery; alternating current, direct current, and a combination of both. The first modern repair shops used direct current exclusively. This was due both to lack of knowledge concerning the characteristics and uncertainty regarding the feasibility of using alternating current; also the high cost of motors and generating apparatus which then prevailed. About seven or eight years ago shops were installed using a combined alternating current and direct current system. In some cases both direct current and alternating current prime generating units were used, and direct current was obtained through the medium of a motor generator set or a rotary converter. The advantages of the latter arrangement are numerous, but the flexibility of operation and the high efficiency of large units would form a determining factor in deciding on this method in preference to the former.

During the past five years several installations have been made where alternating current is used exclusively, probably the most prominent being that of the New York, New Haven & Hartford shops at Readsville, Mass. The committee is dubious, even at this time as to whether or not the best plan is to use alternating current to the exclusion of direct current, as no doubt exists but what increased output can be obtained from certain classes of machine tools by the use of variable speed direct current motors, in view of the present high labor costs, this is certainly an important consideration. The recent development of multi-speed alternating current motors, and the increased use of variable speed alternating current motors in conjunction with mechanical gear changes, however, may in a short time alter present engineering practice.

Practically all of the machine tool builders have so arranged their machines that the constant speed motor drive may be used through the medium of mechanical gear changes, and in small shop installations where the power plant capacity does not exceed 500 k.w., it would seem inadvisable to complicate power distribution by installing both alternating and direct current, inasmuch as the relative saving in labor would be less than in a large shop where, as in a great many cases, manufacturing is done for smaller shops on the system.

In the first place, we must consider the original cost, beginning at the power plant and ending at the motors which drive the machinery. The cost of certain parts of the power plant will remain practically constant, regardless of whether or not direct or alternating current is used, provided, of course, that the same method of operating generating units is decided on. If alternating current turbines are compared with direct current generators with cross-compound condensing engines, the cost of the building and foundations would be considerably greater for the latter installation; the boilers, condensers and other accessories would remain practically the same. We should assume, however, that the comparison would be between alternating current turbo-generators, and direct current turbo-generators; in which case the cost of the building and all equipment, exclusive of the generating units, would be essentially the same. Where alternating current is decided on the installation of turbines is practically the only thing considered, as recent developments in the design of non-condensing units makes them eminently satisfactory where water cannot be secured for condensing purposes. In the case of direct current many engineers prefer engine type units to turbo-generator units.

We give below the approximate first costs of generating units in a power plant installation to provide power and light for a large locomotive and car repair shop, with fifty pits in erecting shop, and sufficient car repair facilities to take care of the division on which the shop is located. Undoubtedly, for a shop of this character and size, most engineers would decide upon three prime generating units of approximately 750 k.w. capacity each; and, if a combination system is considered, two motor generator sets of approximately 300 k.w. capacity each, to provide direct current for the variable speed machine tools and, possibly, for the cranes. The first cost for generating units will be as follows:

Alternating current (turbines)	$41,500
Alternating current (engine type generating units)	74,500
Direct current (turbines)	65,000
Direct current (engine type generating units)	72,000
Alternating and direct current (turbines)	51,500
Alternating and direct current (engine type generating units)	84,500

Special attention is called to the fact that the above estimate on a combined system, contemplates the use of a synchronous motor in connection with the motor generator set as a power factor corrective device. It is the usual method for electrical manufacturers to rate alternating current generating units on the basis of 80 per cent. power factor. By actual practice, however, it has been ascertained that the power factor usually prevailing in both manufacturing establishments and railway shops, will vary from 55 per cent. to 75 per cent., rarely being as high as 80 per cent. On this account it is generally advisable to install a synchronous motor in the power plant, which can either be efficiently used for driving direct current generators or as a synchronous condenser, floating on the line to bring the power factor up to the desired point.

It is clearly evident that a straight alternating current installation is far cheaper in first cost, from the power plant standpoint, than either of the alternatives. Next, the distributing system must be considered. We are practically limited on account of commutation to 250 volts as a potential for transmitting direct current, but in the case of alternating current 440 volts or 550 volts are generally used. Taking into consideration transmission line losses alone, we can transmit nearly four times the power at 440 volts alternating current as at 250 volts direct current, with the same percentage of loss. In shop practice, however, the limited distance at which power is transmitted generally makes the current carrying capacity of the wire a determining feature, rather than the losses through resistance. On this account it will probably be found that the transmission lines for alternating current will require about 60 per cent. as much of copper as those used for direct current. The percentage of loss, however, will, of course, be considerably less, on account of the higher voltage at which the current is transmitted.

It has been customary where direct current is used to operate both arc and incandescent lamps from a 250-volt circuit. With an installation of this character, the life and efficiency of incandescent lamps are greatly reduced, and the arc lamps do not operate as successfully as on a 125-volt circuit. The development of the tungsten lamp for shop lighting has practically made imperative the use of 125-volt transmission, which in the case of direct current would require special generators for this service, on the assumption that 250 volts has been standardized for power service. It is very simple in the case of alternating current to obtain the low tension lighting voltage, as the transmission can be made at the full voltage of the generating unit, and transformed to the desired potential near the point at which it is used.

Some consideration must be given to the relative cost of alternating current and direct current motors for operating machinery and cranes. We would estimate that the cost of alternating current motors for individual and group drive would be less than direct current motors, but the cost of alternating current motors for cranes will be somewhat in excess of direct current motors, as the fundamental principles of alernating current motor construction make it necessary to use on cranes much larger alternating current motors than direct current motors. The ease of speed control, however, is approximately the same, and it is doubtful if an operator could tell from the operation of the crane whether direct current or alternating current motors were applied.

As a general proposition, it is only fair to assume that the difference in first cost of electrical equipment for a large railway repair shop, based on the use of alternating or direct current, would be mainly represented by the difference in cost of

*Abstract of a committee report presented at the Chicago meeting of the Association of Railway Electrical Engineers, November, 1911. The committee consisted of C. J. Causland (chairman), C. L. Kincaid, J. C. McElree, J. H. Klink, A. I. Totten and J. Dixon.

the power plant equipment. The saving in the transmission system, by using alternating current, and the lower cost of alternating current motors for driving machine tools, would be practically counterbalanced by the increased cost of alternating current motor driven cranes and variable speed machines, where it is necessary to provide them with mechanical speed changes.

We should bear in mind the possible necessity in the future of transmitting current for a long distance for the purpose of operating pumps, or furnishing light to depots or other property removed from the power plant. Also the possible likelihood of purchasing alternating current from a hydroelectric company based on rates lower than the same current could be generated by the railway.

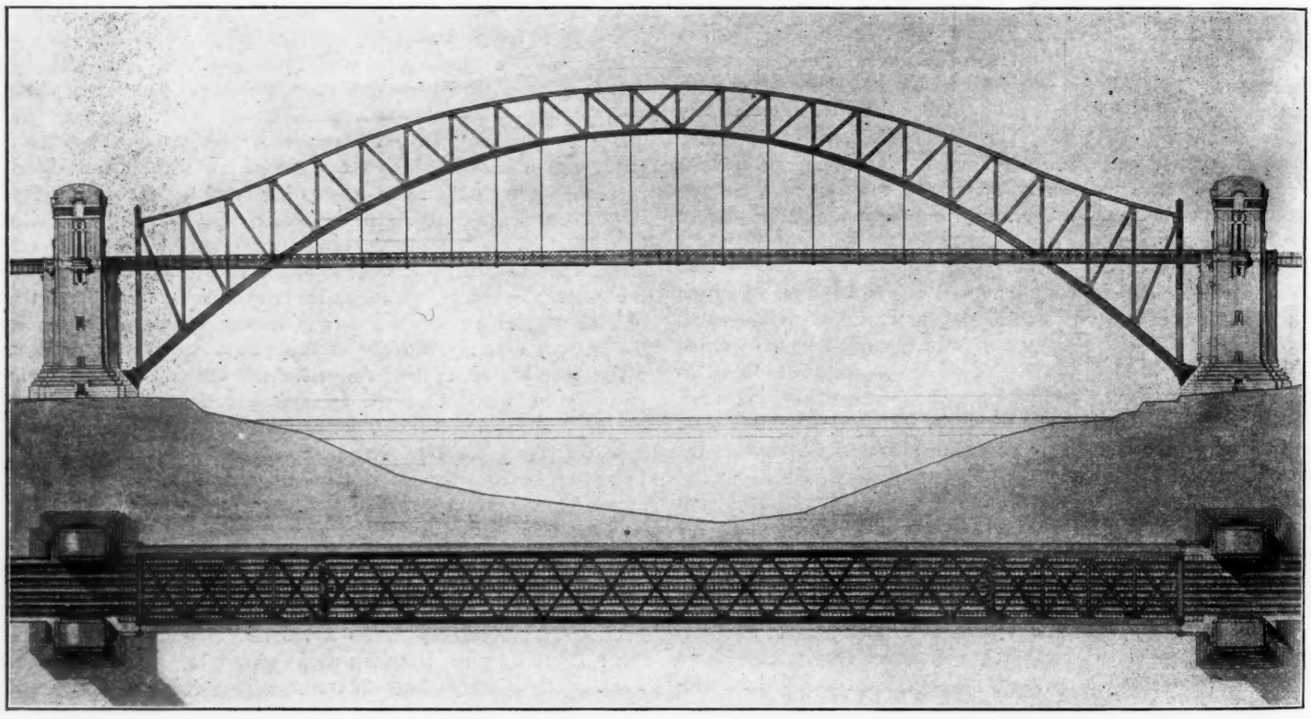
The general conclusion is that alternating current should be used exclusively in small division railway repair shops, where the capacity of generating units in the power plant does not exceed 500 k.w., and that the combination of alternating current and direct current should be used in larger installations. The direct current units should be installed for the purpose of operating variable speed machine tools only. The use of alternating current for operating cranes, transfer tables, turntables and hoists is recommended as being wholly satisfactory, and no reason exists for converting alternating current to direct current for any of these purposes.

USE OF COMPRESSED AIR.

The modern railway shop requires compressor capacity of 1,000 to 10,000 cu. ft. of free air. In order to obtain this volume, it is necessary to use steam representing from 150 to 1,500 boiler h. p., which probably equals the amount of power necessary to operate all shop equipment driven by other methods. We desire to unequivocally endorse the substitution of electric power for compressed air wherever possible, and the development of electric drive for hoists, riveters, chipping hammers, drills, etc., makes it wholly practical to eliminate the majority of pneumatic appliances. It is also desirable to distribute a number of small compressors through the various buildings, these compressors to be electrically driven and arranged to automatically start and stop through pressure governors. While this method may not be wholly feasible under present operating conditions, it would not only be feasible but strongly advisable if the compressed air consumption is greatly reduced by the substitution of electrical equipment as above indicated.

STEEL ARCH BRIDGE OVER THE EAST RIVER, NEW YORK.

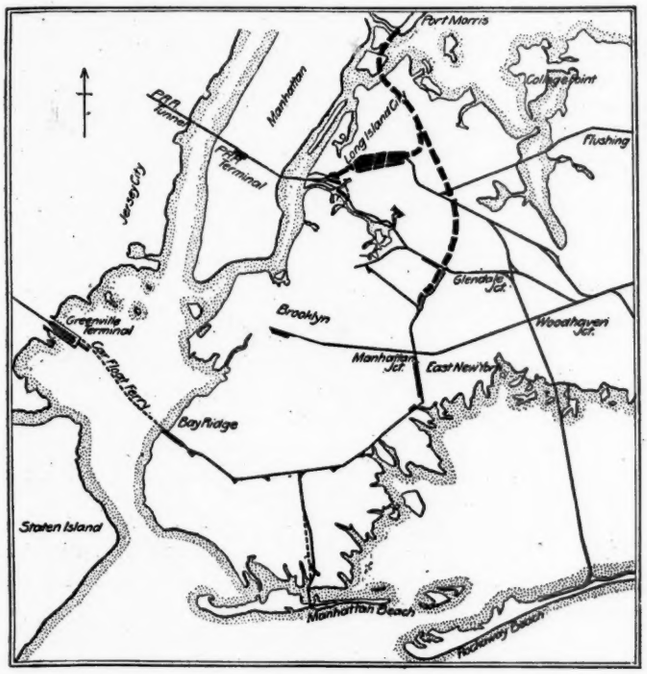
Contracts were let last week for the steel work of the New York Connecting Railroad's bridge over the East river at Ward's and Randall's islands. The New York Connecting, which is owned jointly by the Pennsylvania and the New York, New Haven & Hartford, is to connect the Long Island Railroad's belt line, now building around Brooklyn from Bay Ridge, with the Harlem river branch of the New Haven. This branch of the New Haven has been six-tracked and will be electrified. A large part of the through freight from New England now carried from the Harlem river terminals of the New Haven around New York harbor by long car ferry routes to the rail terminals of the roads on the New Jersey shore will be carried by the new line down to the Bay Ridge terminals and thence by car ferry across to the Pennsylvania's Greenville terminals, as shown on the accompanying map. There will also be a connection with the Pennsylvania tunnels at Sunnyside yards, by which through passenger cars and trains can be handled.



Elevation and Plan; Hell Gate Bridge.

The plans for this connecting road were published in the *Railroad Gazette* of December 28, 1906, April 12, 1907, and May 31, 1907. In the latter article, drawings of the proposed four-track 1,000-ft. steel arch bridge over Hell Gate were shown. A somewhat similar view of the bridge is published herewith. Since the plans of the bridge were made public in 1907 there have been but few changes. The New York Connecting is to be 12 miles long. The southerly part will be largely on an earth fill with concrete retaining walls, the numerous intersecting streets being spanned by concrete arches and by girders. The approach to the bridge over Hell Gate was originally planned as an all-steel viaduct. It has since been decided to use plain concrete piers, supporting girder spans. This construction will be used also across Ward's island. The line will be carried over Little Hell Gate channel between Ward's and Randall's islands by a five-span deck truss bridge. The character of this bridge is not fully

decided on, however, as the War Department has not decided what it will do with regard to a proposed plan for deepening this channel. The viaduct continues over Randall's island and will be carried over the Bronx kills on a bridge yet to be decided on, for the same reason that Little Hell Gate bridge is still in doubt. The contract just let is for the Hell Gate bridge, the portion over



New York Connecting Railroad and Pennsylvania Railroad Connections.

Ward's island and the southerly approach. The work is to be completed in the spring of 1914. The great majority of the right-of-way for the whole road has been acquired.

Gustav Lindenthal, consulting engineer of the railway, designed the bridge, with Palmer & Hornbostel, architects.

ACCIDENT BULLETIN NO. 40.

The Interstate Commerce Commission has issued Accident Bulletin No. 40, containing the record of Railway accidents in the United States during the three months ending June 30, 1911, and also the totals for the year to that date.

The number of persons killed in train accidents during the quarter was 152, and of injured 2,936. Accidents of other kinds, including those sustained by employees while at work, by passengers in getting on or off cars, by persons at highway crossings, by persons doing business at stations, etc., by trespassers, and others, bring up the total number of casualties, excluding "industrial accidents," to 17,317 (2,216 killed and 15,101 injured). The casualties are classified in Table No. 1, given herewith, including some details from Table 1B, not here shown.[1] The accident statistics of electric lines are given in a separate table. Supplementing the statement of railway accidents proper, the commission gives the following record of "Industrial Accidents"; those occurring to employees of the railway on railway premises in which the movement of cars or engines is not involved:

Industrial Accidents to Employees.

	Killed.	Injured.
While working on tracks or bridges	42	4,993
At stations, freight houses, engine houses, coaling stations, water stations, etc., where no moving railroad car or engine is involved	6	4,371
In and around shops	20	8,441
On boats and wharves	5	226
At other places	14	1,129
Total	87	19,160

Adding the casualties to employees in industrial accidents to the figures given in the larger table, the total number of employees killed, including those not on duty, is 659, and injured 28,605; and this makes the total number of persons killed, all classes, 2,303, and injured 34,261.

TABLE NO. 1A.—COMPARISON OF PRINCIPAL ITEMS WITH LAST QUARTERLY BULLETIN AND WITH ONE YEAR BACK.

		Bulletin 40.	Bulletin 39.	Bulletin 36.
1.	Passengers killed in train accidents	21	28	12
2.	Passengers killed, all causes	58	66	55
3.	Employees (on duty) killed in train accidents.	107	105	125
4.	Employees (on duty) killed in coupling	37	55	45
5.	Employees (on duty) killed, total (Table 1B).	512	647	711
6.	Total, passengers and employees (items 2 and 5, above)	570	713	766
7.	Other persons killed (including trespassers, nontrespassers, and employees not on duty), all causes	1,646	1,411	...
8.	Employees killed in industrial accidents	87	113	...

The total number of collisions and derailments in the

[1]This bulletin is the fourth to be issued under the revised accident law. The quarterly bulletins previous to No. 37 included only four classes of accidents, namely, (1) collisions, (2) derailments, (3) casualties to passengers, and (4) casualties to employees on duty. The statistics of other accidents on railroads previous to July 1, 1910, will be found in the annual statistical reports of the Commission.

The class termed "Industrial accidents," as found in the present bulletin, includes a large part of those casualties to employees which in former bulletins have been included in the eighth item ("Other causes") of Table No. 1, as explained in Bulletin No. 37.

TABLE NO. 1.—CASUALTIES TO PASSENGERS, EMPLOYEES AND OTHER PERSONS.

	Passengers.		Employees on duty.		Employees not on duty.		Other persons not trespassing.		Trespassers.		Total persons.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collisions	9	664	44	451	2	10	2	17	1	8	58	1,150
Derailments	12	826	49	415	1	10	3	4	12	27	77	1,282
Accidents to trains, cars, or engines, except collisions, derailments, and boiler explosions	...	49	5	178	...	2	...	9	...	2	5	240
Bursting of, or defects in, locomotive boilers or boiler attachments	...	...	9	261	...	1	...	2	3	...	12	264
Total train accidents	21	1,539	107	1,305	3	23	5	32	16	37	152	2,936
Accidents to roadway or bridges not causing derailment, such as fires, floods, landslides, explosions, etc	1	2	4	9	...	...	8	13	...	...	13	24
Coupling or uncoupling cars (does not include accidents with air or steam hose)	...	...	37	627	...	...	...	...	...	...	37	627
While doing other work about trains (not in shops or engine houses) or while attending switches	...	...	17	3,750	...	...	...	...	...	...	17	3,750
Coming in contact, while riding on cars, with overhead bridges, tunnels, or any signal apparatus, or any fixed structure above or at the side of the track	2	11	10	321	...	5	...	4	10	23	22	364
Falling from cars or engines	2	73	73	1,065	4	8	6	18	94	147	179	1,311
Getting on or off cars or engines	21	556	29	1,496	9	74	2	29	154	513	215	2,668
Other accidents on or around trains not here named	...	767	8	183	1	18	1	123	2	55	12	1,146
Being struck or run over by engine or car at stations or yards	9	22	114	287	18	19	28	68	261	262	430	658
Being struck or run over by engine or car at highway grade crossings	1	2	2	2	1	1	168	501	34	29	206	535
Being struck or run over by engine or car at other places	...	1	104	104	19	10	23	21	728	344	874	480
Other causes	1	100	7	110	5	28	15	269	31	95	59	602
Total other than train accidents	37	1,534	405	7,954	57	163	251	1,046	1,314	1,468	2,064	12,165
Grand total	58	3,073	512	9,259	60	186	256	1,078	1,330	1,505	2,216	15,101

quarter now under review was 2,550 (989 collisions and 1,561 derailments), of which 101 collisions and 187 derailments affected passenger trains. The damage to cars, engines and roadway by these accidents amounted to $2,008,471, as shown below:

TABLE NO. 2.—COLLISIONS AND DERAILMENTS.

	Number.	Loss.	Killed.	Injured.
Collisions, rear	121	$121,356	4	150
Collisions, butting	92	208,348	33	516
Collisions, train separating	72	32,739	1	55
Collisions, miscellaneous	704	313,531	20	429
Total	989	$675,974	58	1,150
Derailments due to defects of roadway, etc.	326	$314,184	27	466
Derailments due to defects of equipment.	690	517,900	11	155
Derailments due to negligence of trainmen, signalmen, etc.	86	53,214	6	140
Derailments due to unforeseen obstruction of track, etc.	60	67,085	6	104
Derailments due to malicious obstruction of track, etc.	22	21,031	1	62
Derailments due to miscellaneous causes.	377	359,083	26	355
Total	1,561	$1,332,497	77	1,282
Total collisions and derailments	2,550	$2,008,471	135	2,432
Total for same quarter of 1910	2,609	2,124,506	123	2,245
1909	2,100	1,703,642	91	1,842
1908	2,130	1,617,398	104	2,008

In Table No. 2A will be found the usual list of class A train accidents—all in which the damage is reported at $10,000 or over, notable cases in which passengers are killed, and those doing damage less than $10,000 and down to $2,000, wherever the circumstances or the cause may be of particular interest:

TABLE NO. 2A.—CAUSES OF 26 PROMINENT TRAIN ACCIDENTS.

[Note.—R stands for rear collision; B, butting collision; M, miscellaneous collisions; D, derailment; P, passenger train; F, freight and miscellaneous trains.]

COLLISIONS.

No.	Class.	Kind of train.	Killed.	Injured.	Damages to engines, cars and roadway.	Reference to record.	Cause.
1	R	F and F	1	3	$1,665	1	Exceeding speed limit at point of collision, engineman held responsible. Was dismissed from the service.
2	B	P and F	..	8	11,533	2	Freight crew held to blame for not looking at time card or making inquiry of each other as to the movement of passenger train. No train orders involved. (See note in text.)
3	B	P and P	1	24	7,512	3	Train No. 2 ran by meeting point. (See note in text.)
4	M	P and F	2	8	4,251	4	Failed to protect train with flag.
5	R	P and F	..	11	3,200	5	Delay in flagging passenger train.
6	B	P and F	..	17	8,900	6	Disobeying orders.
7	B	F and F	2	2	9,204	7	Misunderstanding of despatcher's orders. (See note in text.)
8	M	F and F	1	2	3,994	8	Engineman with meeting orders pulling through siding and fouling main track.
9	R	F and F	1	2	4,935	9	Not protecting train by flag.
10	B	P and P	14	28	32,200	10	Failure of train No. 12 to receive order No. 19. (See note in text.)
11	B	F and F	4	4	10,700	11	Despatcher overlooking orders.
12	R	F and F	4	4	22,000	12	Caused by bad condition of lights and failure of engineman to observe them. (See note in text.)
13	B	P and F	2	18	3,700	13	Conductor thinking he had plenty of time remained out on main track too long, and neglected to send out flag.
		Total	32	131	$123,794		

DERAILMENTS.

1	D	F	1	2	$3,915	1	Excessive speed over skeleton track.
2	D	P	1	3	3,493	2	Broken rail. (See note in text.)
3	D	F	2	1	6,068	3	Explosion of locomotive boiler caused by low water.
4	D	P	..	10	15,867	4	Excessive speed on curve.
5	D	P	12	101	30,000	5	Defective track; error in judgment of section foreman in not flagging. (See note in text.)
6	D	F	3	2	4,500	6	Trestle gave way.
7	D	P	1	10	3,482	7	Broken rail.
8	D	P	2	1	13,615	8	Defective track; error in judgment of track foreman in not having sufficient ballast on track and at the heads of the ties on the outside curve to hold it.
9	D	P	1	32	5,700	9	Spreading rails.
10	D	P	1	2	5,200	10	Washout; breaking of dike of irrigating ditch.
11	D	P	2	6	40,000	11	Excessive speed on sharp curve. (See note in text.)
12	D	F	1	5	2,950	12	Excessive speed.
13	D	F	3	..	3,000	13	Section foreman neglected to get a right-hand switch point. "Feather rail" used as a temporary splice to make connection.
		Total	30	175	$137,790		
		Total collisions and derailments	62	306	$261,584		

Collision No. 2, between westbound freight train No. 553 and eastbound passenger train No. 48, was due to the engineman of the freight train relying on his memory as to the time of passenger train No. 48. He thought the train was due to leave E at 5 a. m., when in fact it was due to leave E at 4.30 a. m. He did not examine his time table, neither was anything said to the fireman or any other member of the crew as to where they should meet this train. The conductor of the freight train thought the engineman was going to M for No. 48, and as he was working on his reports, he did not notice the train was passing M until it had gone past the switch; and shortly after passing the switch the collision occurred.

There was a failure on the part of each member of the freight-train crew to have an understanding as to where No. 553 would meet No. 48. None of the members of the crew of the freight train looked at the time table or made inquiry of each other as to this passenger train.

Collision No. 3 was a butting collision of passenger trains —No. 2 moving about 6 miles an hour colliding with No. 1 running about 35 miles an hour. Train No. 2 ran by the meeting point. Employees at fault; in the service of the company more than eight years. The conductor is the only living employee considered responsible. He claims to have sounded one blast of the air whistle approaching station, which, according to the rules of the company, called the attention of the engineman to a meeting point. This signal, the conductor claims, was answered by the engineman, who reduced speed of train to some extent. The conductor thought he saw train No. 1 standing on siding, though both his brakeman and the porter told him they did not see the train, and while he was debating in his mind as to whether or not train was on siding the collision occurred. The conductor could and should have stopped the train by using the emergency air brake valve.

Collision No. 7, between extra freight No. 2633 and extra freight No. 2410 at TL switch north of GL station, was due to misunderstanding of meeting orders. Conductor of extra 2633 received order No. 15 giving him running order to TL and to meet extra 2410 at GL. At GL he received another order (No. 17) to meet extra 2410 at LV instead of GL and at the same time received an order (No. 18) annulling order No. 17. These orders were put out by a despatcher who was but recently appointed and when the despatcher annulled order No. 17 the meet in order No. 15 still stood. These orders were delivered to the engineman

by the head brakeman on the train and not by the conductor. The report states that the engineman says he understood the orders to meet with extra 2410 had been annulled. A heavy fog prevailed at the time. The conductor and engineman were held responsible for the accident and were dismissed from the service.

Collision No. 10 (Indianola, Neb., May 29), in which 14 persons were killed and 28 injured, between westbound passenger train No. 9 and eastbound passenger train No. 12, was due to the failure of the operator at M to deliver an order to the eastbound train, which provided for the meeting place of these trains. The operator who handled the orders at M failed to deliver to crew of train No. 12 order No. 19. (Conductor of train No. 12, when he arrived at RW, not having order No. 19, proceeded without meeting train No. 9.)

The conductor on train No. 12 received at M a train order which stated that he should have, among other orders, order No. 19. He failed to check the orders given him by the operator at M, and for that reason did not notice the non-delivery of this order. The operator at M is at fault for failure to deliver order No. 19. The conductor and engineman in charge of train No. 12 are at fault for failure to properly check their orders and see whether they had order No. 19.

The operator at fault had been off duty 16 hours with 8 hours' sleep, and on duty 5½ hours at the time of the accident. He has been in the employ of this company as operator and extra despatcher for the past six years, and claims that he did not receive order No. 19 addressed to No. 12, and consequently did not hold this order for delivery to the train when the conductor reported for orders. The train despatcher's record shows that the order was transmitted to the operator at M.

Collision No. 12 was a rear collision of eastbound freight trains, derailing engine and five cars of the rear train and the caboose and five cars of the forward train; the wreckage being thrown across four main tracks. About this time two other trains, bound west on tracks Nos. 1 and 3, were caught in the wreckage. This accident was due to the bad condition of lights and the failure of enginemen to observe the rules governing them, the lights on the home signal being out, and no effort made by towerman to have them lighted until after the wreck occurred.

The first train passed the block station F going east on track No. 2 at 11:16 p. m. and stopped about one-half mile east of the station, on account of air brakes leaking. The flagman who was ordered back to flag this train was a new man with only one month's service and was not familiar with the road and did not go back a sufficient distance to insure full protection to his train and he also failed to place a lighted fusee between the tracks when called in. The following train passed block station F at 11:31 p. m. with the signal set at danger, and struck preceding train at about 11:32 p. m. The lights on the home signal were out, but distant signals were burning and showed yellow, which is caution.

Towerman at place of accident stated that he saw train following the one that was struck entering the block with his signal set at danger, and realizing that the preceding train had not yet cleared, he grasped a red light and the extra towerman, who was in the tower with him, grasped a white light, and both swung the lamps, endeavoring to stop the train. The red light was swung from the tower window facing track No. 2, the white light swung from the window on the west side of tower, for neither one had time to get to the ground where a signal would be more apt to be seen; but all their efforts to stop the train failed.

Derailment No. 2 was caused by passenger train No. 4 running about 40 miles an hour, the engine jumped the track and went down embankment of about 10 feet. A thorough investigation failed to disclose the cause. However, the report furnished says a rail was found lying in the ditch, which

ANNUAL TABLE NO. 1B.—CASUALTIES TO PASSENGERS, EMPLOYEES, AND OTHER PERSONS, YEAR ENDING JUNE 30, 1911.

	Passengers.		Passengers on freight trains.		Persons carried under agreement or contract.		Total pass.		Trainmen.		Trainmen in yards.		Yard trainmen.		Switch tenders, crossing tenders, and watchmen.		Trackmen and bridgemen.		Other employees.		Total employees on duty.		Employees not on duty.		Other persons not trespassing.		Trespassers.		Total persons.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Collisions	55	3,176	14	121	24	375	93	3,672	184	1,634	41	578	34	480	2	7	16	127	20	245	297	3,071	7	135	6	79	33	37	436	6,994
Derailments	39	2,374	2	150	7	360	48	2,884	184	1,211	18	145	19	193	1	4	13	76	14	119	249	1,748	6	34	3	45	43	88	349	4,799
Accidents to trains, miscellaneous	..	85	..	15	1	61	1	161	8	441	1	93	8	109	..	..	1	17	..	30	18	690	..	4	2	48	2	11	23	914
Bursting of boilers	..	5	..	..	..	..	..	5	5	52	1	174	3	132	..	3	..	1	..	20	56	1,092	..	1	..	3	3	5	59	1,106
Total train accidents	94	5,640	16	286	32	796	142	6,722	428	4,048	61	990	64	914	3	14	30	221	34	414	620	6,601	13	174	11	175	81	141	867	13,813
Accidents to roadway or bridges not causing derailment	2	16	..	..	..	4	2	20	2	25	..	13	1	1,529	..	10	..	1	..	16	5	73	1	2	10	20	2	..	20	115
Coupling or uncoupling cars	..	..	..	..	..	..	..	..	69	858	33	511	96	4,026	..	155	..	86	11	57	209	2,966	..	..	..	..	..	..	209	2,966
While doing other work about trains, etc	..	..	..	..	..	..	..	1	34	10,186	34	3,286	41	4,026	1	155	..	86	19	446	131	18,185	..	4	..	8	..	..	131	18,198
Coming in contact with overhead structures, etc	5	28	..	..	1	7	6	35	52	698	7	267	12	489	1	6	..	11	4	39	76	1,510	2	13	1	9	30	81	115	1,648
Falling from cars or engines	43	264	..	17	11	36	54	317	157	2,207	60	1,046	119	1,795	1	27	17	107	25	277	379	5,459	12	52	14	64	389	564	848	6,456
Getting on or off cars or engines	86	2,414	2	54	2	72	90	2,540	49	2,983	28	1,372	38	2,499	4	67	14	167	27	442	160	7,530	37	305	18	155	520	1,696	825	12,226
Other accidents on or around trains	5	2,521	3	287	3	444	8	3,252	..	62	..	26	..	21	..	16	8	167	15	494	23	786	2	91	8	448	21	218	62	4,795
Being struck or run over at stations or yards	39	104	..	4	4	7	43	115	52	121	85	187	111	280	43	67	172	265	226	457	689	1,377	90	94	133	364	1,015	1,025	1,970	2,975
Being struck or run over at highway grade crossings	1	3	..	..	..	..	1	3	1	3	..	2	..	6	1	3	1	11	6	11	20	39	11	7	812	2,261	148	124	992	2,434
Being struck or run over at other places	1	4	..	..	..	3	1	4	47	69	2	3	4	11	37	19	313	263	105	130	508	495	111	54	83	136	2,962	1,375	3,667	2,064
Other causes	5	399	..	1	2	24	7	424	14	254	3	89	4	119	2	44	13	97	15	224	51	827	13	158	64	1,433	116	390	251	3,232
Total other than train accidents	187	5,753	2	363	25	595	214	6,711	477	17,466	252	6,802	426	10,788	103	425	540	1,173	453	2,593	2,251	39,247	279	780	1,143	4,898	5,203	5,473	9,090	57,109
Grand total	281	11,393	18	649	57	1,391	356	13,433	905	21,514	313	7,792	490	11,702	106	439	570	1,394	487	3,007	2,871	45,848	292	954	1,154	5,073	5,284	5,614	9,957	70,922

had indications of a heavy flange blow on the end of the rail and near the outer side as if the rail had been mismatched and the wheel struck the end of the rail. It also had the flange mark of the wheel on the outer base of the rail almost its entire length, which indicated that a joint had been broken. The track had been inspected by the section foreman at 11:20 a. m. on the day of the accident, which occurred at 5:30 p. m., and there were no indications of the track washing or settling.

Derailment No. 5 was that of a passenger train running 50 miles an hour over a piece of track that was undergoing repairs on the day of the accident, and was caused by the uneven, irregular and insecure condition of track, which would not permit a train to pass over it in safety at a high rate of speed. The derailed train had no notice of the condition of the track. (Martin's Creek, N. J., in April, heretofore reported.)

Derailment No. 11, in which two persons were killed and six injured, was due to excessive speed on a 7-deg. curve in a deep cut. Estimated speed of train at time of derailment, about 45 miles an hour. The engineman at fault was familiar with the road, and the 7-deg. curve at point of accident was brought specially to his attention. The fact that equipment was all new steel cars in first-class condition is a potent factor in the loss of life being so small; only one passenger being injured in this accident.

Electric railways reporting to the commission had 89 persons killed and 771 injured; and there were 38 collisions and 17 derailments. Train accidents are charged with four fatalities—all employees. The total number of passengers killed from all causes was 6 and of employees 18, including 4 in industrial accidents. The number of trespassers struck or run over by cars was 35; 24 killed and 11 injured.

YEARLY TABLES.

This bulletin is the first yearly publication of the accident records under the law of May 6, 1910; it includes all accidents, and therefore the total figures shown in the annual tables are not comparable with those of the annual bulletins for preceding years. We reproduce Table 1-B, a summary of the quarterly tables, but containing more details than we usually give in our quarterly reprint. Previous to July, 1910, the monthly accident reports did not include the table on the preceding page and the following:

	Killed.	Injured.
Employees:		
Not on duty	292	954
In and around shops	73	35,530
On boats or wharves	47	1,204
At other places	74	5,420
Total employees not required in monthly reports previous to July 1, 1910	486	43,108
Other persons not trespassing	1,154	5,073
Trespassers	5,284	5,614
Total other persons	6,438	10,687
Total of all classes not required in monthly reports previous to July 1, 1910	6,924	53,795

The total number of casualties for the year is 160,555 (10,396 killed and 150,159 injured.) Of this number 439 killed and 79,237 injured are classed under the head of "Industrial accidents," and do not appear in Table 1-B.

Annual Table No. 1-B includes a small proportion of casualties which did not appear in the quarterly bulletins, the reports from which they are taken having been received after the quarterly bulletins were printed.

ANNUAL TABLE 1C.—CASUALTIES TO PASSENGERS AND EMPLOYEES, YEARS ENDING JUNE 30.

	1911.		1910.		1909.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Passengers:						
In train accidents	142	6,722	217	7,516	131	5,865
Other causes	214	6,711	204	6,240	204	6,251
Total	356	13,433	421	13,756	335	12,116
Employees:						
In train accidents	633	6,775	715	6,791	520	4,877
In coupling accidents	209	2,966	206	2,985	161	2,353
Overhead obstructions, etc.	78	1,523	96	1,377	76	1,229
Falling from cars, etc.	588	13,346	586	13,196	481	10,259
Other causes	1,655	22,192	1,780	44,269	1,218	33,086
Total	3,163	46,802	3,383	68,618	2,456	51,804
Total passengers and employees	3,519	60,235	3,804	82,374	2,791	63,920

Electric Railways.—The annual table of accidents on electric railways shows a total of 420 persons killed and 3,663 injured, of which 10 deaths and 399 injuries are classed as occurring in industrial accidents. Collisions are charged with 74 passengers and 12 employees killed; derailments, one passenger, four employees and one other person killed. The total of casualties to "other persons" not trespassing is 133 killed and 481 injured; trespassers, 117 killed and 119 injured. These totals include a few casualties which did not appear in the quarterly bulletins. The total number of collisions on electric roads was 176; damage to cars, engines and roadway, $95,830; total derailments, 79; damage, $14,636.

EMPLOYEES IN SERVICE.

The number of employees in service of the railway companies on June 30, 1911, was as follows:

Steam Roads.—Employees in service June 30, 1911.

	Number of persons.
1. Trainmen (enginemen, firemen, conductors, brakemen, "trainmen," rear flagmen, train baggagemen)	235,841
2. Other persons employed on trains (dining-car employees, train porters, etc.)	13,245
3. Yardmen (all employees in yard train work and switching—enginemen, firemen, conductors, brakemen, foremen, droppers, fieldmen, etc.)	91,694
4. Switch tenders, crossing tenders, and watchmen	30,231
5. Bridgemen and trackmen	470,556
6. Others (station and miscellaneous employees, excluding all those officers, clerks, shopmen, indoor employees, and others who ordinarily are engaged in work in which they are not liable to railroad accident)	218,408
7. Total	1,059,975
8. Employees excluded from item No. 6	588,058
9. Total persons employed by steam roads June 30, 1911	1,648,033

ANNUAL TABLE NO. 2.—COLLISIONS AND DERAILMENTS; DAMAGE TO CARS, ENGINES, AND ROADWAY, YEARS ENDING JUNE 30.

	1911.				1910.				1909.			
	Number.	Loss.	Killed.	Inj'd.	Number.	Loss.	Killed.	Inj'd.	Number.	Loss.	Killed.	Inj'd.
Collisions, rear	1,099	$1,241,193	109	1,526	1,311	$1,398,763	119	2,324	859	$933,375	83	1,556
Collisions, butting	609	1,250,519	187	2,610	695	1,514,381	194	3,008	485	874,729	159	1,878
Collisions, train separating	370	145,360	7	163	418	164,883	5	197	386	146,067	6	159
Collisions, miscellaneous	3,527	1,664,984	133	2,695	3,437	1,551,252	115	2,236	2,681	1,154,520	94	1,802
Total	5,605	$4,302,056	436	6,994	5,861	$4,629,279	433	7,765	4,411	$3,108,691	342	5,395
Derailments due to defects in roadway, etc	1,225	$1,007,460	57	1,560	1,115	$914,642	42	1,337	991	$708,658	25	1,195
Derailments due to defects of equipment	2,824	2,379,074	64	689	2,734	2,227,352	40	636	2,362	1,875,646	29	651
Derailments due to negligence of trainmen, signalmen, etc.	397	319,351	36	508	377	238,843	23	311	307	186,768	25	329
Derailments due to unforeseen obstruction of track, etc.	309	358,166	66	492	350	464,414	58	825	331	444,308	81	486
Derailments due to malicious obstruction of track, etc.	84	102,161	16	176	66	165,185	18	227	51	93,037	21	166
Derailments due to miscellaneous causes	1,421	1,383,512	110	1,374	1,276	1,184,243	159	1,478	1,217	1,063,095	83	1,338
Total	6,260	$5,549,724	349	4,799	5,918	$5,194,679	340	4,814	5,259	$4,371,512	264	4,165
Total collisions and derailments	11,865	$9,851,780	785	11,793	11,779	$9,823,958	753	12,579	9,670	$7,480,203	606	9,560

Proportions killed and injured during the year.

	Number employed.	Killed.	Injured.	Number employed for one killed.	Number employed for one injured.
Trainmen	235,841	1,218	29,306	194	8.0
Yardmen	91,694	490	11,702	187	7.8
Switch tenders, crossing tenders, and watchmen	30,231	106	439	285	68.9
Trackmen and bridgemen	470,556	724	19,906	650	23.6
Total employees in service	1,648,033	3,602	126,039	458	13.1

Electric Railways.—Employees in service June 30, 1911.

	Number of persons.
1. Trainmen[1] (enginemen, firemen, conductors, brakemen, "trainmen," rear flagmen, train baggagemen)	20,541
2. Other persons employed on trains (dining-car employees, train porters, etc.)	84
3. Yardmen (all employees in yard train work and switching—enginemen, firemen, conductors, brakemen, foremen, droppers, fieldmen, etc.)	946
4. Switch tenders, crossing tenders, and watchmen	324
5. Bridgemen and trackmen	12,512
6. Others (station and miscellaneous employees, excluding all those officers, clerks, shopmen, indoor employees, and others who ordinarily are engaged in work in which they are not liable to railroad accident)	4,727
7. Total	39,134
8. Employees excluded from item No. 6	12,453
9. Total persons employed by electric railways June 30, 1911	51,587

[1]Includes motormen.

A CO-OPERATIVE SYSTEM AS APPLIED TO TRAIN SERVICE.

BY A TRAINMASTER.

The piece work system in the departments to which it has been applied has in the main brought favorable results to all concerned, because it puts a prize on individual effort—it develops the incentive to produce. In turning over the pages of the train and engineman's schedules we do not find that the payment for freight train service by the train mileage system is in harmony with the desire of the company or (after removing the element of seniority and luck connected with the payment of train service by the mileage system) is to the best interests of the men.

The desire of the company is ton miles, and the spirit of the schedules is train mileage. Naturally, the two interests are enemies from birth. In the beginning, and on some very small roads still, train service was paid for by the day or for some lump sum per month. There was nothing in this arrangement to encourage a man to double the road unless he happened to be starting from his home terminal. As an encouragement for more mileage out of the engines as well as other things, the mileage system of payment was evolved. This was in the day of "fido" engines and when nobody strained their nerves with tonnage. The mileage system of payment fitted the conditions very nicely at that time.

Since that day we have seen wonderful changes in the power and operating conditions in general, and yet no move is made to modernize the system which actuates the men behind the guns to get the best results out of these big instruments, and hence the inevitable discord between heavy tonnage trains and the payment of train service by train mileage—that pounding symptom of leaky valves.

The companies, to meet their needs, must have every ton possible moved for the mileage for which they pay, while train and enginemen can increase their own numbers as well as lighten their own burdens and still make the same money by a radically opposite view, which of course is human nature, pure and simple.

Did you ever stop to consider that it would be possible as well as practicable to pay for train service on a ton mileage basis plus a fixed stipend for train mileage? And that in such a system the drag, that best paying train from a ton mileage standpoint for the company, would also be an equitable if not a more desirable catch for the chain gang man first out? Today he is worrying for fear he will catch a drag and is figuring long in advance on what his chances are of getting passed by the next chain gang crew behind, which has been fortunate enough to catch a hot shot. He is also figuring how much tonnage and work he can evade so as not to get passed.

It is not the intention of this article to say what the rates should be, as these would have to be made for each division separately; and even then would necessarily be changed perhaps as conditions changed. Competent representatives from both parties could do this. The intention is rather to point out the advisability of such a change; and the writer, who has had some experience with the subject from both sides, has gathered the following facts and figures as a basis of argument.

The figures are taken from a record of actual operation, and are the averages of four months, two of winter and two of summer.

The division chosen is on a representative trunk line with a half way point, *B*, which is the intersection of an auxiliary division. The following is the data:

L Length of division *A* to *C*: 100 miles.
l Length of subdivision *A* to *B*: 50 miles; *B* to *C*: 50 miles.

R Rating of power in service between *A* and *B*: 2,275 tons.
rw Rating same power *B* to *C*: 1,255 tons.
re Rating same power *C* to *B*: 1,380 tons.

Vw Average movement *A* to *B*: 11,114 tons per day.
vw Average movement *B* to *C*: 4,695 tons per day.
Ve Average movement *B* to *A*: 9,781 tons per day, 88 per cent. of *Vw*.
ve Average movement *C* to *B*: 3,860 tons per day, 82.2 per cent. of *vw*.

Tm Average train mileage between *A* and *B*: 2 x 442.5 miles per day.
tm Average train mileage between *B* and *C*: 2 x 245 miles per day.

Tw Average train haul *A* to *B*: 1,256 tons per train, 55.2 per cent. of rating.
Te Average train haul *B* to *A*: 1,105 tons per train, 48.6 per cent. of rating.
tw Average train haul *B* to *C*: 958 tons per train, 76.3 per cent. of rating.
te Average train haul *C* to *B*: 788 tons per train, 57.1 per cent. of rating.

Percentage of empties to loads *A* to *B*: 33.9 per cent.; *B* to *A*: 47.1 per cent.
Percentage of empties to loads *B* to *C*: 54.1 per cent.; *C* to *B*: 47.7 per cent.

Nature of traffic *A* to *C*: various loading, empty refrigerator and stock cars, but no time restrictions.
Nature of traffic *C* to *A*: stock, meat, fruit, merchandise, time freight, averaging about 15 miles an hour.

Positive direction of business: that direction in which trains must arbitrarily be run regardless of full tonnage to meet time requirements and protect high class business. It may and it may not be the direction in which the greatest volume of business is moved. It may be influenced from time to time by various other factors, but in this case it has been uniformly from *C* to *A*.
Negative direction of business: opposite from positive.

To attain an ideal train haul the positive direction of business is obviously the point of attack. In this connection, let us see what a monthly train mileage for the division is. This is equal to 30 $(Tm + tm)$, or 41,250 train miles. Then see what a monthly train mileage would have been had the train haul been increased in the positive direction of business to 75 per cent. of the rating. Solving $2\ (ve \times 50 \times 30)$, we get

$$\frac{}{0.75 \times re},$$

2 x 5,594 miles per month. Then 11,188 miles per month would have moved the business between *B* and *C*, which of course is accomplished by increasing the train haul *C* to *B* from 788 tons to 1,035 tons per train, while train haul *B* to *C* would have risen from 958 to 1,259 tons per train (4 tons over the rating for the ruling grade) by $\frac{vw \times 30 \times 50}{5594}$

Train mileage between *A* and *B* would then be $\frac{2\ (Ve \times 50 \times 30)}{.75 \times R}$,

or 17,201 miles, having the effect of necessitating a westward train haul of 1,938 tons per train, by $\frac{Vw \times 50 \times 30}{-8600.3}$

It now follows that 17,201 + 11,188, or 28,389 miles, is all that would be necessary to have moved the business were it possible to handle 75 per cent. in the positive direction of business. Then 41,250 — 28,389, or 12,861 miles at 50 cents per mile is $6,430.50—the sum saved per month, or $77,166 per

year. We note from the actual performance that 13 crews making 3,173 miles per month can handle 41,250 miles, and that if 75 per cent. of the rating in the positive direction of business had been maintained, 9 crews making 3,154 miles per month would have moved the business. Hence, there being 5 men to the crew and neglecting the variation between their respective salaries, we find that per man they would have saved the company $\frac{\$6,430.50}{9 \times 5}$, or $142.90. Ten per cent. ($14.29) would probably be a very gratifying addition to each man's pay check at the end of the month, and the other $70,000 per year would build a good many sidings, yards and other needed improvements, tending to soon pay for themselves by increasing ton mileage per train.

Under the present system, the chief despatcher can start two sections of the meat train from *C*. The first one has 30 loaded meat cars, weighing 1,050 tons, and the second one has only 15 meat cars, but is filled out with dead freight to 1,050 tons, which is plenty from *C* to *B*, but less than 50 per cent. of the rating *B* to *A*. Neither crew is at all anxious to fill out at *B*, and if the chief instructs them to do so it is 10 to 1 that one or both will go in late; and after a few failures of this kind the chief loses some of his interest. Under a community of interest plan, the chief could say to the first and second meat trains that they have just 6 hours *C* to *A*, and ask them to see if they could put the 45 meat cars (1,575 tons) together at *B* and deliver the whole at *A* inside the 6 hours,, and let the other fellow fill up to 2,275 tons; or, if not close together enough for that, then each fill out to what they can make the time with. It is just 11 to 0 that these 11 men will give the company full value received for their train mileage; this simply because the trainman's and the engineman's maximum income is derived from the same source that the company's income is. When a man's pay check is being affected his head begins to work. This will also either make a man out of the drone on the train or get rid of him; and do it quicker than the trainmaster can.

The applications of the above example are multifarious. If business were heavy and labor scarce, an experimental bonus for ton mileage on top of the present pay schedules would need only a short trial to prove its utility.

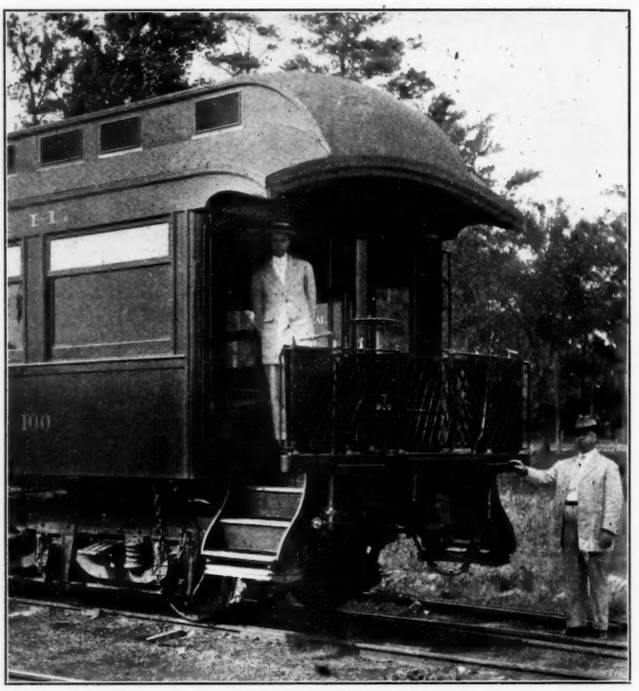
THE ITALIAN RAILWAYS.

The annual report of the Italian State Railways for 1910 gives an interesting retrospective comparison between the operation of the Italian railways under state management and under private management. The mileage was increased during the fiscal year of 1910 from 8,211 to 8,247 miles by the opening of a number of branch lines. The total length of lines in operation, including the navigation lines of the States of Messina, was 8,305 miles. In the operation of the lines the management has made such additions and betterments as were found practicable. Some improvement in the make-up of passenger trains was effected, but the cars in use are not up to the requirements of the traffic. Progress has been made in equipping the cars with Westinghouse air brakes, and also in heating and lighting. Train delays were diminished and the service on the lines which were affected by the earthquake was entirely reorganized in the latter part of 1909. The average delay of the principal trains was reduced in 1910 to about 11 minutes, from an average of from 13 to 17 minutes in the previous year. The financial results of the system are far from satisfactory. In a recent address, the minister of public works admitted that the net earnings of the roads were far below the requirements for fixed charges, to nothing of maintenance expenditures.

Members of the Russian special committee on the proposed trans-mountain tunnel at Archot have left Tiflis to examine the geological aspect of the question. The tunnel if made will be about 15 miles.

EXTENSION CAR STEP.

As the result of an accident, sustained some time ago from the step box ordinarily used in assisting passengers on and off of passenger cars, the extension car step shown in the accompanying illustrations has been devised. At its best the step-box is an unstable affair, especially in descending from the car



Extension Car Step, Raised.

steps, as the passengers are not always careful to step on the middle of it. The porters are also often negligent in having the box ready, which inconveniences the passengers. The illustrations show the extension step in the open and closed positions. It is easily applied to the car, and may be quickly operated by swinging a lever on the end of the car through an angle of 180

Extension Car Step, Lowered.

degrees. A pedal in the back board of the second step, which operates a clutch locking the steps in either the open or closed position, must be pressed down before the operating lever can be moved. In this way the danger of inquisitive and meddlesome persons working the device, while the train is in motion, is greatly reduced.

When the step is lowered the bottom is about 6 in. from the top of the rail. The treads are covered with corrugated rubber to prevent slipping. The step is always in place ready for use, and is secure and more convenient than the ordinary porter's step-box. It weighs only about 36 lbs., and that it is strong enough is indicated by one of the illustrations showing two men standing on the bottom step. It has been placed on some cars in the South. The inventor is J. S. Blake, and the step is being manufactured in Charlotte, N. C., by the Blake Car Step Works.

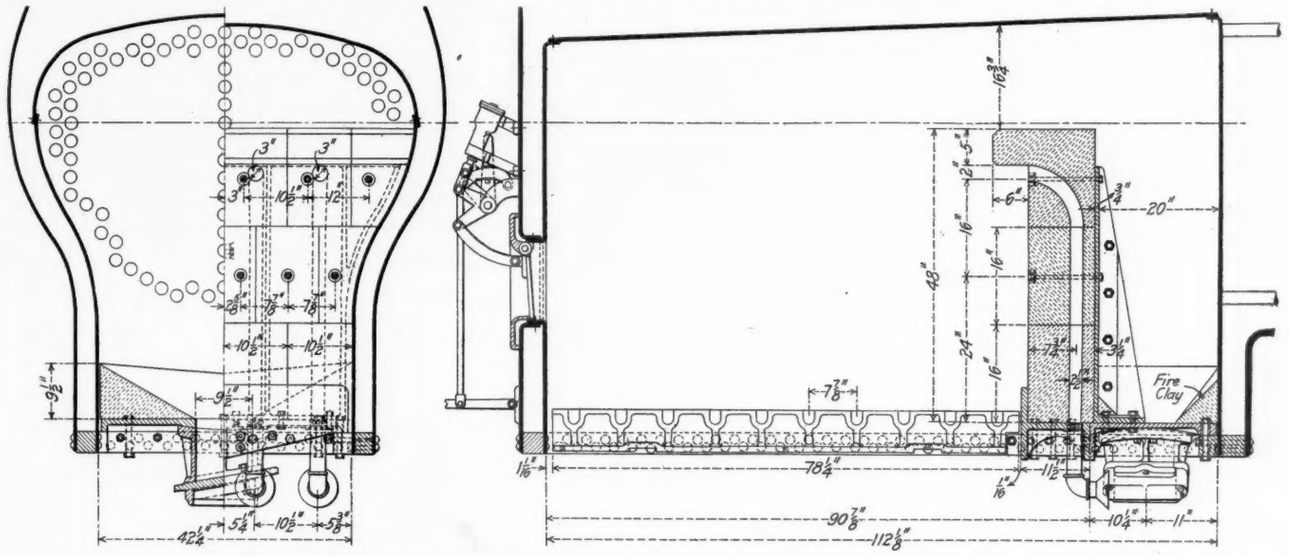
COMBUSTION CHAMBER AND HOLLOW BRICK WALL.

The improved firebox with a hollow brick wall and combustion chamber, designed by F. F. Gaines, superintendent motive power, Central of Georgia, and described by him in an article in the *Railway Age Gazette* of August 5, 1910, page 225, continues to give such good results, especially with regard to its protection of the tubes, that its use has been extended to other locomotives on the Central of Georgia as well as on several railways in the north. The hollow brick wall on engine No. 1014 has been in service since February, 1909. The reports show no tube failures after a service of 80,000 miles, and it is expected that the life of the tubes will be about three times that obtained from similar engines with plain fireboxes. Inferior coal does not give so much trouble with clinker on the grate and lack of steam to the extent of causing an engine failure, while other engines in the same service frequently fail from these causes. Following are the results of tests of three locomotives equipped with different arrangements of fire brick in the firebox:

The same train, 18 carloads of coal, weighing 1286.25 tons, and the same engineer and fireman were used on each trip. The distance between Macon and Columbus is 100 miles, and four trips were made with each engine. The analysis of the coal used was: Moisture, 1.39; volatile combustible, 30.56; fixed carbon, 55.11; ash, 12.94. B. t. u. per lb. of coal 13,179. Unfortunately, in spite of every effort, the average time of each trip and the average number of stops varied considerably for the different engines, so that the actual results are not strictly comparable.

The application of the hollow brick wall to a ten-wheel freight locomotive on the Chicago Great Western is shown on the drawing. It has been in service on a trial engine for five months, and recently two other engines were so equipped. While no tests have been made the first engine has been operating in a bad water district, where there is unusual trouble due to leaky tubes, and the hollow wall has largely reduced this. Comparative tests will be made to determine the relative value of the vertical hollow brick and the ordinary type of brick arch.

The hollow wall has been found especially efficient in improving the combustion and in preventing leaking tubes in fireboxes with very short water legs. The hollow brick wall is now being handled by the American Arch Company, New York City.



Application of Gaines Hollow Brick Wall to Chicago Great Western Freight Locomotive.

The fuel question is one of the unsatisfactory features in connection with the operating expenses of the Argentine railways, for, whereas in other countries a period of dull trade as a rule means cheaper coal, in Argentina the reverse is true. When trade in Argentina is bad, due to crop failure, which is the only cause of bad trade, the cost of coal rises at once, because the steamers which import the coal depend on getting a cargo of grain for the return trip, and if they fail to secure a good cargo of grain, they have to charge a higher rate on coal; so in years of bad crops, the Argentine railways are affected by diminished revenues and increased fuel bills.

TEST OF CONSOLIDATION FREIGHT LOCOMOTIVES ON THE CENTRAL OF GEORGIA BETWEEN MACON, GA., AND COLUMBUS, JANUARY, 1911.

Engine.	Cylinders.	Heating Surface, Sq. Ft.	Average Time Consumed.	Average Number Stops.	Total Time Consumed in Stops.	Average lbs. Coal per 1,000 Ton-miles.	Average lbs. Water Evaporated per lb. of Coal.	Miles Run to One Ton of Coal.	Relative Efficiency.
1014*.....	21 in. x 32 in.	2,987	6 hr. 32 min.	7	4 hr. 38 min.	101	8.10	15.38	100.
1012**.....	21 in. x 32 in.	3,022	7 hr. 19 min.	5¾	4 hr. 41 min.	163	5.74	9.54	61.96
1716†.....	22 in. x 30 in.	3,230	7 hr. 25 min.	10	7 hr. 16 min.	115	7.39	13.14	85.58

*Engine equipped with a new firebox, a combustion chamber and a hollow brick wall.
**Original boiler and plain brick arch.
†Plain brick arch.

General News Section.

The commission of railway securities ("the Hadley Commission"), is said to have finished its report to President Taft. The President is expected to return to Washington November 12, when it is expected, the contents of the report may be made public.

Passenger train No. 43 of the Rock Island was stopped by robbers near Hurlburt, Ark., on the morning of November 1, and the mail car and express car were partly destroyed by explosives, but the robbers were frightened, while at their work, by the approach of a switching engine, and they ran away.

In one year the stationer of the Rock Island Lines distributed to the various departments of the road 3,329,568 rubber bands, and it is estimated that these are enough to reach if stretched end to end, from Chicago to Kansas City. These rubber bands cost a total of more than $5,000, and investigations of the way they were used indicate that probably half of them, or $2,500 worth, were wasted.

The annual track inspection of the Bessemer & Lake Erie has just been completed, and chief engineer H. T. Porter, with other officers, followed the inspection by taking the section foremen on an excursion over the Lake Shore & Michigan Southern from Erie to Buffalo. This visit to another line appears to be a permanent feature on the B. & L. E., the section foremen having been taken last year and the year before over divisions of the Pennsylvania.

C. P. Rodgers, who left New York September 17, in an aeroplane with the purpose of crossing the continent, succeeded in accomplishing the feat in 49 days, having arrived at Pasadena, Cal., November 5. He took a roundabout course, passing through Chicago, Ill., and San Antonio, Tex., and the distance flown is calculated at 4,231 miles. The actual time spent in flying was 82 hours, 4 minutes, and the average rate while in motion was 51.59 miles an hour.

That the Pennsylvania Railroad is running a train lighting instruction car with which by means of lectures and demonstrations employees will be given uniform instruction. The apparatus in the car consists of a 32-cell storage battery, a turbo-generator, a variable speed motor with necessary controlling apparatus for driving the axle devices, and a number of axle generators with their regulating equipments. One end of the car has been partitioned off and equipped as an office and sleeping quarters for the instructor.

The Canadian Pacific has just given out its prizes for the best floral displays at its stations, the winners are the station agents at Woodstock, New Brunswick; Sherbrooke, Quebec; Portage La Prairie, Man., and Agassiz, British Columbia. The last named station took the grand prize, the credit of which is given to the wife of the station agent, who, besides attending to the flowers, also has the custody of her thirteen children. The Canadian Pacific has encouraged the cultivation of flowers for more than 20 years and now sends out over 33,000 packages of seeds every spring.

Since January, 1910, when the pension system was established on the Rock Island Lines, 12 retiring employees of the road have had their names added to the list. There are now 107 former employees receiving pensions ranging from $25 to $150 a month, 13 having died since the system was started. Retirement is compulsory at 70 years of age, and an employee receives a pension if at the time of his retirement he has been in the continuous service of the company for 20 years. After a continuous service of 25 years pensions are granted, irrespective of age, if the employee has been permanently disabled in the service.

Judge Knapp and Commissioner of Labor Neill, acting as mediators under the Erdman act, between the Baltimore & Ohio telegraph operators and officials, have brought about a settlement whereby the telegraphers get an increase of approximately 5 per cent. in wages; the working hours in offices, which were formerly 11 hours will be reduced to 10 hours; in the three-men offices the hours will be 8; and there will be an increase of five cents in overtime. The total cost of these increases in wages and changes in hours will approximate 8 per cent. The telegraphers had demanded reductions in working hours from 11 to 9 hours; three-men offices from 9 to 8 hours; increases in wages amounting approximately to 13 per cent.; increases of ten cents in all overtime rates; and other changes in working conditions.

Bruce W. Benedict, for several years in the motive power department of the Atchison, Topeka & Santa Fe, has been appointed director of the shop laboratories in the department of mechanical engineering at the University of Illinois. Mr. Benedict was born at Buda, Ill., in December, 1876, and graduated from the University of Nebraska in 1901. Before going to college he served an apprenticeship on the Chicago, Burlington & Quincy, and after graduating returned to that road, where he was successively, machinist, assistant in testing laboratory, assistant road foreman of engines, road foreman of engines, general foreman of locomotive and car repairs and mechanical inspector. He was then for two years editor of the *Railway Master Mechanic* at Chicago, which position he left to become supervisor of schedules on the Santa Fe, and he has more recently been bonus supervisor on that road.

Fire Fighting Apparatus On Locomotives.

W. R. Barton, fire prevention inspector of the Missouri Pacific, has developed a fire fighting apparatus for use on locomotives. A test of the appliance was recently made at the Ewing Avenue shops of the Missouri Pacific in St. Louis. It was demonstrated that a stream of water could be thrown 65 ft. in the air with 200 lbs. of steam pressure on a locomotive. All yard engines and some of the road locomotives will be equipped with it. The tanks of the large yard engines hold 6,000 gals. of water. The plan is to carry 50 ft. of 1¼ in. steam hose on a reel under the running board. Steam hose is used, as the water which comes from the tank and is forced through the branch pipe is hot, and in a short time would destroy the ordinary rubber hose. The hose connection is placed on the branch pipe between the boiler check and the injector. When an engine reaches the fire in the yards a switchman jerks the hose from the reel and attaches it to the coupling leading from the branch pipe. The engineer starts the injector, while the fireman goes out on the running board and opens the valve in the branch pipe leading to the boiler check. The cost of the apparatus is about $35.

Manufacturers Demand Light on Trust Law.

The Illinois Manufacturers' Association has asked that a committee of prominent men in various walks of life throughout the country shall get together and draft a bill for the amendment of the Sherman anti-trust law to be submitted to Congress at its next session.

The committee is to be composed of the following: Charles Piez, Chicago; La Verne W. Noyes, Chicago; Richard Olney, Boston; Louis D. Brandeis, Boston; F. O. Watts, Nashville, Tenn.; Dr. A. T. Hadley, Yale University; Samuel Untermeyer, New York City; Murdo McKenzie, Trinidad, Colo.; Clark Howell, Atlanta; James J. Hill, St. Paul; Rudolph Spreckels, San Francisco; and John Wanamaker, Philadelphia.

The association in a statement regarding the reasons for its action said in part:

"Recent decisions of the Supreme Court imply that the legality of the larger combinations must be submitted to the court for adjudication; and the determination of the administration to enforce the act means that business will be subjected to periodical stocks for years to come.

"The Illinois Manufacturers' Association has among its members some of the most successful corporations engaged in the industrial enterprises. Its members have faith in their country, are obedient to the law and to the dictates of fair dealing. Nor are they so lacking in patriotism that they are unwilling to submit to a temporary setback in business if necessary to purge industry of lawless acts.

"But are the large industrial combinations of the last twenty

years simply the result of a defiant disregard of the law, in pursuit of illicit profits? Are the claims of economy achieved by combination or greater and more rapid trade expansion secured by larger capital, simply idle claims to hide the real purpose of these enterprises? Are the abuses practiced by some of these combinations only the reflections of dishonesty, or are they a necessary outgrowth of these combinations?

"The Illinois Manufacturers' Association does not feel that lawlessness among the leading business men of the country is so rampant as to justify an affirmative answer to these questions.

"There exists a crying necessity for ascertaining the true economic value of industrial combinations, for determining whether the Sherman anti-trust law is still economically wise, and for deciding whether big business is to continue, and, if so, under what rules and regulations.

"The only remedy seems to be by the enactment of a law which will prescribe a rule for those doing an interstate business."

Good Advice for the Improvident.

D. C. Moon, general manager of the Lake Shore & Michigan Southern, has lately issued a circular, the substance of which is here given, informing employees of the policy of the company concerning assignments of wages. This is an important subject, sometimes dealt with by managers without due care, and Mr. Moon's circular is worthy of imitation because of its fulness and detail. Unpleasant subjects are often dealt with briefly, because of their unpleasantness; but brevity sometimes proves a mistake. This notice is issued two months in advance of the time that it goes into effect, so as "to give those now in trouble a chance to arrange their affairs." The first three paragraphs are a reprint of an order already in force.

LAKE SHORE & MICHIGAN SOUTHERN RAILWAY COMPANY.

Board orders will not be accepted by the company unless approved by the head of the department in which the person signing the order is employed, and then only in especially urgent cases covering board and lodging for the *first two months* after the employee enters the service of the company.

"Assignments on account of insurance premiums, company's doctors' examination fees and the purchase of watches and uniforms must be made on forms provided for that purpose.

"The execution of assignments and orders other than for the above exceptions will be regarded as cause for immediate dismissal from the service."

We regard "selling time" or assignment of wages at a discount, in any form, as unwise, unnecessary, and a discredit to the employee and as usually indicating he is careless of habit and reputation. This in turn is reflected to some extent upon the company for having such employees, and more especially upon the great mass of other employees, because the public does not usually trouble itself to discriminate in this respect. Neither the man who "sells" nor his family has the proper benefit of what he earns.

Discount rates are exorbitant and are often followed by garnishee proceedings, further adding costs to be deducted from wages.

The man who is in such financial embarrassment is usually troubled in mind, often is over-indulgent in habits of living, and his mental and physical ability to safely and properly perform duty is impaired, and he cannot be regarded as a good man to keep in service.

On and after January 1, 1912, each employee in every department will be expected, whenever possible, to personally receive his pay check. When sickness, absence or working conditions prevent, the checks will be delivered in accordance with existing instructions.

Board assignments must conform to instructions, be limited in amount and contain directly or indirectly only board items. (Assignments for borrowed money, tobacco, cigars, liquor, etc. are prohibited.) Heads of departments authorized to approve, must carefully scrutinize each order.

The assignment of wages to anyone, in any form, at a discount, whether followed by garnishee or not, hereafter, is forbidden, and violation, if discovered, will be considered cause for dismissal. The pay checks of this company are worth full face value, and for the benefit of all employees and the families, and for the reputation of the company, we shall hereafter expect every employee in this respect to receive the full return of pay for his work.

To more than 95 per cent. of our employees, who are living right, this will be of no concern.

To the remainder, however, who are not, it is both a request and a warning. We prefer that you heed, for the general benefits above expressed. If you do not, your service with this company is not desired.

Telephone Train Despatching.

News items concerning the introduction of telephones on train despatching wires are becoming literally almost too numerous to mention. Information concerning the extension of telephone despatching on railways already using the telephones largely have been printed in these columns nearly every week for a long time. The Baltimore & Ohio has construction work going on between Grafton and Parkersburg; Grafton and Wheeling; Wheeling and Newark; Connellsville and Fairmont; Rockwood and Johnstown; and Pittsburg and Wheeling. These lines aggregate 486 miles, parts of which mileage were mentioned in a former item. About half the stations will have Gill selectors and half Western Electric selectors. Some of the lines will be in operation probably during the present month. The B. & O. intends to continue its present policy until every division of the road is equipped with telephone lines.

The Missouri, Kansas & Texas has lately put in operation two telephone despatching circuits, one from McAlester to Denison, 95 miles; and one from Smithville to Hillsboro. The first-named line has numerous telephones in booths at passing tracks where there is no agent. The way-station equipment consists of telephone arms of the accordion type, equipped with head band, receivers and Gill selectors of the two-figure main-line bell type, on which the clearing out impulses have been eliminated. No call requires over 3½ seconds. At non-test offices the line wires terminate on knife switches which when open disconnect all office equipment, including the lightning arresters. Knife switch panels are provided at test offices to faciliate opening the line to locate faults or patching a section of emergency line into the circuit in case of trouble.

The other line, which is on the Waco division, has 34 telephones in stations and nearly as many in booths at side tracks. The wire chiefs' test boards are arranged with voltmeter and mil-ammeter tests to enable them to locate faults quickly and with accuracy. The despatchers use the regulation breast telephones and individual Gill silent calling keys. Wrecking trains carry portable telephones.

The Louisville & Nashville, which already operates 2,200 miles of telephone despatching circuits, has ordered from the Western Electric Company 42 selectors for the line from Lexington, Ky., to Quicksand, 96 miles. There will also be a message circuit on this line.

The Chicago, Rock Island & Pacific has ordered Gill selectors from the United States Electric Company for 30 telephone stations, and the Gulf, Colorado & Santa Fe has given a similar order for 12 stations.

American Land and Irrigation Exposition.

The American Land and Irrigation Exposition opened at Madison Square Garden, New York, on November 3, and will continue to November 12. The entire garden, including the basement and galleries, as well as the main floor, is occupied by the exhibit. In the main hall are the exhibits of the railways, chambers of commerce, land and development companies, and others who are making an effort to arouse interest in more extensive and intensive agriculture. The mention of a few of the exhibits will give some idea of their character. For instance, the Great Northern has a large display of agricultural products, including grain in the straw, potatoes and other vegetables, and a most extensive and enticing display of apples. There are also pictures of scenes along the route of the railway; and in connection with the exhibit, James J. Hill has given a $1,000 silver cup for the best 100 lbs. of wheat grown in the United States in 1911. The Canadian Pacific has a small field of alfalfa actually growing with a system of irrigation in operation. The Pennsylvania Railroad has models drawn accurately to scale of the Horseshoe Curve, the Cumberland Valley and models of the Hudson river tunnels. The International Harvester Company has on exhibit a miniature irrigation farm divided into three

sections, each showing a specific kind of irrigaton. One of these systems is for use in trucking sections where irrigation is necessary. It consists of a number of overhead pipes from which water is forced, giving an irrigation that is much like rain. Alaska exhibits not only gold ore, but preserved berries, hay, grain and garden truck. The Kansas City, Mexico & Orient, besides the products along its own lines, exhibits 12 silver cups that are to be awarded for competitions in the production of wheat, corn, oats, cotton, potatoes, barley, sugar beets, apples, hops and alfalfa.

The balconies contain exhibits of railways, colonization companies, seed companies, etc. During the entire time that the exhibit is open, lectures are being given in the lecture hall by various exhibitors. These lectures are, in the main short, well illustrated by lantern slides and moving pictures, and are descriptive of the various areas of farm and agricultural land through the United States.

In the basement of the garden there are exhibits of some farm machinery and of various devices and methods by which farm labor may be made more attractive and more efficient. For instance, the Crocker-Wheeler Company, Ampere, N. J., have a number of exhibits showing the application of their motors to a number of farm operations, such as pumping, milking, sheep shearing, feed grinding, etc.

Of course, with all of these exhibits is a large amount of advertising and descriptive pamphlets, a few of which are mentioned in these columns under Trade Publications.

War Department Endorses Scientific Management.

A modified form of the Taylor system of shop management has been in use at the Watertown, Mass., arsenal for two years. Secretary of War Stimson has made public an exhaustive report of the results which have been obtained and has summed up the situation as follows: "The Watertown arsenal has been used practically as an experiment station, with a view of trying out the theory before applying it generally. The results thus far are highly gratifying and full of promise. There has been an undoubted increase in the efficiency of manufacture at the shop and a material reduction in the cost of manufacture, but at the same time, and to my mind of even of more importance, these results have been obtained without in any wise endangering the interests of the workingmen, either by decreasing their pay or requiring unpleasant exertion or speeding up. On the contrary, any increase in real efficiency must inure to the benefit of the workingmen.

"I have been too long and too vitally interested in and active in movements which make for the advancement of the conditions of labor for me now to lend even the slightest encouragement to any theories which work counter to the true interests of labor. To my mind, scientific management can and deserves to prevail only where increased efficiency means increased human efficiency and the workingmen's participation in the rewards resulting from efficiency. It means a betterment and in no wise impairment of the conditions of labor. A change for that kind of betterment is the only kind of change which the government will permit through the installation of any scientific management. We are still very much in the experimental stage, but I have strong hopes that by cooperation and a willingness to see the facts fairly, economies will result to the government, betterment to workingmen, and a more satisfactory and more human relation between the two in the future than in the past."

The following extract from the report of Brigadier General Crozier gives a brief outline of the methods which have been used. "Something over two years ago the trial at the Watertown arsenal of some of the elementary features of what is known as the 'Taylor system' was authorized. An expert in shop management was employed, and under his guidance the method of putting work into shops so systematized that orders for manufacture now go from the office to the shops with a much more complete arrangement and supply than formerly of drawings, specifications, lists of parts, bills of material and orders relating to particular parts of the structure to be produced, so that the foremen are relieved from much of the semi-clerical and other office work which they used to have to do, and for which they are not well qualified and cannot attend to without a neglect of other more appropriate duties. The work of planning the course of component parts of the structures to be manufactured through the shops of the arsenal has been systematized, so that this course shall be regular and orderly, and the work shall at no time be held through the lack of some component which is not at hand when needed, and that no wasteful effects shall arise through congestion of work at particular machines, or the idleness of other machines, or workmen while waiting for assignment of operations which should have been planned for them in advance.

"For this purpose there has been installed a planning room equipped with personnel and appliances for the regular production of what might be called the time tables of the thousands of pieces which must travel through the various shops on their way from the stage of raw material to that of finished product, without collisions or unnecessary delays. The issue of material from the storehouse to the shops has been systematized, and the task of estimating the amount of material required placed among the duties of persons other than those who are to make use of the materials in manufacture, so as to reduce the likelihood of over-estimates, to insure the possession of the material at the time when it is needed, prevent the disappearance of material while awaiting use, and the duplication of issues, and to insure the return to the storehouse of surplus material; with the result of a useful reduction of the amount of material issued, and supposedly used for particular fabrications. The care of material in store, and the accountability for it, have been systematized so as to insure more frequent and accurate check of the material on hand with the clerical statement of what ought to be on hand. The method of caring for machines and tools has also been systematized so as to preserve their efficiency. For example, the proper maintenance of the condition and tightness of the extensive system of belting, and the systematic tempering and grinding of cutting tools; such improvements have been made in the efficiency of certain machines as to greatly increase their output.

"The principal elements of wastage in the machine shops include failure to appreciate and to utilize the full and efficient power of machine tools, lack of planning by which machines are frequently without work, the employment of skilled workmen to bring work to machines or to procure and grind their cutting tools, etc. By the establishment of specified feeds and cuts the work done by the machines is increased, and by regulating the flow of the work so that it shall be even and continuous, and employing laborers and messengers to supply the work and tools to the skilled workmen, the latter are able to devote the time and labor which they previously expended in other ways to work proper for their grade.

"The average premium of all machinists who have been placed on premium work in the machine shop at the Watertown arsenal has been 25 per cent. of their wages. The real point in the matter, however, is the determination by a method of scientific common sense of the time within which the work can and should be done, and the particular method of compensation as a stimulus for meeting this time is not important.

"In view of the successful results obtained, a board of officers assembled at the Watertown arsenal recommended the adoption of these methods for similar work at other manufacturing arsenals, with such changes in details as local conditions seemed to require. In accordance with this recommendation, preliminary steps toward introducing the methods, so far as they are applicable, have been taken at several other arsenals. Due, it is believed, to an erroneous conception of the purposes which it is intended to accomplish by these methods, the employees at one of the other arsenals to which the changes are to be applied have protested against the installation.

"The department has not yet reached a conclusion as to the extension to other arsenals of the part of the 'Taylor system' of shop management which affects the workmen, and it is not intended to do so in advance of further trial at the Watertown arsenal, but it seems certain that either by this system or by some other, it ought to be possible to secure better co-operation of the employees among themselves and between them and the management than has been had in the past."

Pan American Railway in Guatemala.

The roadbed of the Pan American Railway in Guatemala has been constructed from Las Cruces to the river Las Aninas, 6½ miles, and timber has been cleared to the end of the nineteenth mile, nearly to the village of Coatepeque. Rails have been laid for 3½ miles. Work is progressing rapidly from Las Aninas,

600 men being employed in grading. Between Coatepeque and the Mexican frontier, it is planned to connect this branch of the road with that of Vato Ancho, so that the Ocos Railroad will form a part of the route to the frontier for a distance of about eight miles. A section of the track, three miles long, will be constructed, starting from the Ocos Railroad at El Prado and crossing the Melendres river. It will join the Pan American Railway at Mexico on the Guatemala side of the Suchiate river. The bridge over the Talchulul river is to be 400 ft. long and 75 ft. high, and the bridges over the Batza and Talpiches rivers are to be 500 ft. long and 115 ft. high.

The American Society of Mechanical Engineers.

At the meeting of the American Society of Mechanical Engineers, to be held November 14, three papers will be presented. One deals with the general aspects of autogenous and electric welding, the origin and principles of each process and the apparatus used in each, by H. R. Cobleigh, International Steam Pump Company, New York, and the other two are on special phases, Thermit Welding, by G. E. Pelissier, superintendent Goldschmidt Thermit Company, New York, and Electric Welding, by C. B. Auel, assistant manager of works, Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa. The discussion will be grouped about the following topics: Electric resistance welding, Electric arc welding, Thermit welding, Oxy-acetylene welding, Oxy-hydrogen welding. Among those who expect to participate are, W. R. Noxon, Davis-Bournonville Company, New York; Nelson Goodyear, Nelson Goodyear, Inc.; W. H. Levin, International Oxygen Company, New York; G. E. Kershaw, Linde Air Products Company, Buffalo, N. Y.; Henry Cave, Autogenous Welding Equipment Company; B. Morgan, Newport, R. I.; W. H. Brown, Cleveland, Ohio; W. H. Spire, Electric Welding Products Company, and L. P. Alford, editor-in-chief the *American Machinist,* New York.

Central Railway Club.

At the meeting of the Central Railway Club, to be held at the Hotel Satler, Buffalo, N. Y., November 10, F. M. Whyte, general manager of the New York Air Brake Company, New York, will present a paper on The Distribution of Instructions and Information in Large Industries.

Master Boiler Makers' Association.

The executive committee of the Master Boiler Makers' Association has decided to hold the sixth annual convention of this association in Pittsburgh, May 14 to 17, inclusive, 1912. The headquarters will be at the Fort Pitt hotel.

Railroad Club of Kansas City.

At the meeting of the Railroad Club of Kansas City, which was held November 9, Congressman William P. Borland gave an illustrated lecture on the Panama Canal.

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting.

AIR BRAKE ASSOCIATION.—F. M. Nellis, 53 State St., Boston, Mass.

AMERICAN ASSOCIATION OF DEMURRAGE OFFICERS.—A. G. Thomason, Boston, Mass.

AMERICAN ASSOCIATION OF GENERAL PASSENGER AND TICKET AGENTS.—W. C. Hope, New York; next convention, Seattle, Wash.

AMERICAN ASSOCIATION OF FREIGHT AGENTS.—R. O. Wells, East St. Louis, Ill. Annual, June 18-21, Chicago.

AMERICAN ASSOCIATION OF RAILROAD SUPERINTENDENTS.—O. G. Fetter, Carew building, Cincinnati, Ohio; 3d Friday of March and September. Annual, March 17, Chicago.

AMERICAN ELECTRIC RAILWAY ASSOCIATION.—H. C. Donecker, 29 W. 39th St., New York.

AMERICAN RAILWAY ASSOCIATION.—W. F. Allen, 75 Church St., New York; November 15, Chicago.

AMERICAN RAILWAY BRIDGE AND BUILDING ASSOCIATION.—C. A. Lichty, C. & N. W., Chicago. Next annual convention, third week in October, 1912, Baltimore, Md.

AMERICAN RAILWAY ENGINEERING ASSOCIATION.—E. H. Fritch, Monadnock Block, Chicago; annual convention, March 19-21, 1912, Chicago.

AMERICAN RAILWAY MASTER MECHANICS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Annual convention, June 12-14, Atlantic City, N. J.

AMERICAN RAILWAY TOOL FOREMEN'S ASSOCIATION.—O. T. Harroun, Bloomington, Ill.

AMERICAN SOCIETY FOR TESTING MATERIALS.—Prof. E. Marburg, University of Pennsylvania, Philadelphia, Pa.

AMERICAN SOCIETY OF CIVIL ENGINEERS.—C. W. Hunt, 220 W. 57th St., New York; 1st and 3d Wed., except June and August, New York.

AMERICAN SOCIETY OF ENGINEERING CONTRACTORS.—J. R. Wemlinger, 13 Park Row, New York; 2nd Tuesday of each month, New York.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.—Calvin W. Rice, 29 W. 39th St., New York.

ASSOCIATION OF AMERICAN RAILWAY ACCOUNTING OFFICERS.—C. G. Phillips, 143 Dearborn St., Chicago; annual, June 26, 1912, Quebec, Que.

ASSOCIATION OF RAILWAY CLAIM AGENTS.—J. R. McSherry, C. & E. I., Chicago; annual convention, May 22, 1912, Los Angeles, Cal.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS.—Jos. A. Andreucetti, C. & N. W. Ry., Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS.—P. W. Drew, 135 Adams St., Chicago; annual, June 24, 1912, New York.

ASSOCIATION OF TRANSPORTATION AND CAR ACCOUNTING OFFICERS.—G. P. Conard, 75 Church St., New York; December 12-13, Louisville, Ky.

CANADIAN RAILWAY CLUB.—James Powell, Grand Trunk Ry., Montreal, Que.; 2d Tuesday in month, except June, July and Aug., Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—Clement H. McLeod, 413 Dorchester St., Montreal, Que.; Thursdays, Montreal.

CAR FOREMEN'S ASSOCIATION OF CHICAGO.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month, Chicago.

CENTRAL RAILWAY CLUB.—H. D. Vought, 95 Liberty St., New York; 2d Thurs. in Jan. and 2d Fri. in March, May, Sept., Nov., Buffalo, N. Y.

CIVIL ENGINEERS' SOCIETY OF ST. PAUL.—D. F. Jurgensen, 116 Winter St., St. Paul, Minn.; 2d Monday, except June, July and Aug., St. Paul.

ENGINEERS' SOCIETY OF PENNSYLVANIA.—E. R. Dasher, Box 704, Harrisburg, Pa.; 1st Monday after 2d Saturday, Harrisburg, Pa.

ENGINEERS' SOCIETY OF WESTERN PENNSYLVANIA.—E. K. Hiles, 803 Fulton building, Pittsburgh; 1st and 3d Tuesday, Pittsburgh, Pa.

FREIGHT CLAIM ASSOCIATION.—Warren P. Taylor, Richmond, Va.; annual May 15, Buffalo, N. Y.

GENERAL SUPERINTENDENTS' ASSOCIATION OF CHICAGO.—E. S. Koller, 226 W. Adams St., Chicago; Wed. preceding 3d Thurs., Chicago.

INTERNATIONAL RAILWAY CONGRESS.—Executive Committee, rue de Louvain, 11 Brussels; 1915, Berlin.

INTERNATIONAL RAILWAY FUEL ASSOCIATION.—D. B. Sebastian, La Salle St. Station, Chicago.

INTERNATIONAL RAILWAY GENERAL FOREMEN'S ASSOCIATION.—L. H. Bryan, Brown Marx building, Birmingham, Ala.

INTERNATIONAL RAILROAD MASTER BLACKSMITHS' ASSOCIATION.—A. L. Woodworth, Lima, Ohio.

IOWA RAILWAY CLUB.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August, Des Moines.

MASTER BOILER MAKERS' ASSOCIATION.—Harry D. Vought, 95 Liberty St., New York. Annual convention, May 14-17, Pittsburgh, Pa.

MASTER CAR BUILDERS' ASSOCIATION.—J. W. Taylor, Old Colony building, Chicago. Annual convention, June 17-19, Atlantic City, N. J.

MASTER CAR AND LOCOMOTIVE PAINTERS' ASSOCIATION, OF UNITED STATES AND CANADA.—A. P. Dane, B. & M., Reading, Mass. Next annual convention, second week in September, 1912.

NEW ENGLAND RAILROAD CLUB.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tuesday in month, except June, July, Aug. and Sept., Boston.

NEW YORK RAILROAD CLUB.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August, New York.

NORTHERN RAILWAY CLUB.—C. L. Kennedy, C., M. & St. P., Duluth, Minn; 4th Saturday, Duluth.

OMAHA RAILWAY CLUB.—H. H. Maulick, Barker Block, Omaha, Neb.; second Wednesday.

RAILROAD CLUB OF KANSAS CITY.—C. Manlove, 1008 Walnut St., Kansas City, Mo.; 3d Friday in month, Kansas City.

RAILWAY CLUB OF PITTSBURGH.—C. W. Alleman, P. & L. E., Pittsburgh, Pa.; 4th Friday in month, except June, July and August, Pittsburgh.

RAILWAY INDUSTRIAL ASSOCIATION.—G. L. Stewart, St. L. S. W. Ry., St. Louis, Mo.; annual, May 12, 1912, Kansas City, Mo.

RAILWAY SIGNAL ASSOCIATION.—C. C. Rosenberg, Bethlehem, Pa.

RAILWAY STOREKEEPERS' ASSOCIATION.—J. P. Murphy, Box C, Collinwood, Ohio.

RICHMOND RAILROAD CLUB.—F. O. Robinson, Richmond, Va.; 2d Monday, except June, July and August.

ROADMASTERS' AND MAINTENANCE OF WAY ASSOCIATION.—L. C. Ryan, C. & N. W., Sterling; September 10, 1912, Buffalo, N. Y.

ST. LOUIS RAILWAY CLUB.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug., St. Louis.

SOCIETY OF RAILWAY FINANCIAL OFFICERS.—C. Nyquist, La Salle St. Station, Chicago.

SOUTHERN ASSOCIATION OF CAR SERVICE OFFICERS.—E. W. Sandwich, A. & W. P. Ry., Montgomery, Ala.

SOUTHERN & SOUTHWESTERN RAILWAY CLUB.—A. J. Merrill, Grant bldg., Atlanta, Ga.; 3d Thurs., Jan., March, May, July, Sept., Nov., Atlanta.

TOLEDO TRANSPORTATION CLUB.—J. G. Macomber, Woolson Spice Co., Toledo, Ohio; 1st Saturday, Toledo.

TRAFFIC CLUB OF CHICAGO.—Guy S. McCabe, La Salle Hotel, Chicago; meetings monthly, Chicago.

TRAFFIC CLUB OF NEW YORK.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August, New York.

TRAFFIC CLUB OF PITTSBURGH.—D. L. Wells, Erie, Pittsburgh, Pa.; meetings monthly, Pittsburgh.

TRAIN DESPATCHERS' ASSOCIATION OF AMERICA.—J. F. Mackie, 7042 Stewart Ave., Chicago; annual, June 18, 1912, Louisville, Ky.

TRANSPORTATION CLUB OF BUFFALO.—J. M. Sells, Buffalo; first Saturday after first Wednesday.

TRANSPORTATION CLUB OF DETROIT.—W. R. Hurley, L. S. & M. S., Detroit, Mich.; meetings monthly.

TRAVELING ENGINEERS' ASSOCIATION.—W. O. Thompson, N. Y. C. & H. R., East Buffalo, N. Y.; August, 1912.

WESTERN CANADA RAILWAY CLUB.—W. H. Rosevear, P. O. Box 1707, Winnipeg, Man.; 2d Monday, except June, July and August, Winnipeg.

WESTERN RAILWAY CLUB.—J. W. Taylor, Old Colony building, Chicago; 3d Tuesday of each month, except June, July and August.

WESTERN SOCIETY OF ENGINEERS.—J. H. Warder, 1735 Monadnock Block, Chicago; 1st Wednesday in month except July and August, Chicago.

WOOD PRESERVERS' ASSOCIATION.—F. J. Angier, B. & O., Baltimore, Md.; annual, January 16-18, Chicago.

Traffic News.

The Western Passenger Association has decided not to make reduced rates during the Christmas and New Year's holiday season this year. At a meeting of the executive committee of the association on November 2 it was also decided to refuse special rates which had been applied for to a number of expositions and conventions.

At a meeting of the Denver chamber of commerce on October 27, that body decided to petition the Interstate Commerce Commission to order a tariff of freight rates from the port of Galveston to Denver, which will produce equality with the rates now in effect between New York and Chicago, and between Newport News and St. Louis.

The governor of Georgia has directed the institution of a suit in the courts against the Nashville, Chattanooga & St. Louis, lessee of the Western & Atlantic, to compel the adoption of Georgia standard freight tariffs throughout the W. & A., both on interstate and intrastate business. The road being owned by the state, the governor proposes to see if the state cannot regulate the rates throughout the length of the railway, which extends into Tennessee.

The Erie and the Lackawanna have notified the Public Utilities Commission of New Jersey that they will not comply with the commission's order requiring the sale of season tickets to Hoboken and Jersey City. Rates to these places are the same as to New York City, New York tickets being used, and the order of the commission was intended to bring this traffic under the control of the state authorities, New York tickets being subject to the control only of the federal authorities.

The Pennsylvania Railroad has established a new department for the purpose of developing its milk traffic. F. B. Barnitz, formerly chief tourist agent, has been appointed milk agent in charge of the department, and I. Elkin Nathans, formerly special agent of the freight traffic department, has been appointed assistant milk agent, with headquarters at Philadelphia, Pa. They will have charge, under supervision of the passenger and freight traffic departments, of the milk and cream traffic of the Pennsylvania Railroad.

During the days that the fleet of war vessels has been lying in the Hudson river, along the west side of New York City, both the elevated and the subway trains of the Interborough Rapid Transit Company carried unusually large numbers of passengers. On Monday, October 30, the subway trains carried over a million and the elevated trains a million. On Tuesday, November 1, when the traffic was nearly as large as this, all of the trains of both the subway and elevated lines ran without a single delay in the 24 hours. The car mileage for the day was 375,000.

The Freight Department of the Pennsylvania Railroad publishes figures from the Department of Agriculture of Virginia, showing that the value of the trucking crop for this year in Accomac County will amount to more than five million dollars. Accomac is one of the two counties of Virginia situated on the Delaware-Maryland-Virginia Peninsula. One farmer this year has five thousand barrels of sweet potatoes to his credit. One potato grower last year had 25,000 barrels of white potatoes which he sold at one dollar a barrel. This year he has only 10,000 barrels, for which he will realize $5 a barrel. His crop this year is worth $50,000. Last year, with two and one-half times the yield, it brought about $40,000.

The members of the Interstate Commerce Commission, sitting as a board of arbitration, continued the hearings at Washington last week, three days, on the question of freight rates from the Atlantic seaboard westward, and then adjourned the case until some time in January, because representatives from New York City desired further time to prepare their testimony. New York, Boston and Philadelphia interests seem to take only a languid interest in this inquiry, but the commercial bodies of Baltimore are presenting their case in great detail, aiming to show that rates from that city should be lower than from either of the others. They brought as witnesses a number of merchants from interior cities, who gave reasons why they desired to have their import freight go through Baltimore.

American Association of Freight Traffic Officers.

The seventh annual convention of the American Association of Freight Traffic Officers will take place at the Sinton Hotel, Cincinnati, Ohio, on November 17 and 18. At the annual banquet on the evening of the first day Fairfax Harrison, president of the Chicago, Indianapolis & Louisville, will deliver an address.

The Increase in Farm Values.

The report of the sale of an averaged-sized farm in central Illinois, with ordinary building on it, at the rate of $300 an acre, probably is to be taken as an indication of the movement of available capital into farm property which non-agricultural fields have failed to attract. The drift of free capital to agricultural lands is always a characteristic of times like these, when other ordinary investment demands are not expanding and when surplus is accumulating because of economical ways of living. The surplus must have outlet in some direction in due time, and people who know the value of land in agricultural states, for its revenue, its increment and its security, turn to the investment of their accumulations in good rural properties.

The price mentioned for this specific farm is, however, far out of line with the average of the United States. The average value of land and buildings in 1910 for the 6,340,357 farms of the country was $39.69 an acre compared with $19.81 in 1900, or an increase of 100.4 per cent. With such an increment in value in ten years, averaging 10 per cent. a year, it is perfectly natural that funds should flow from bankers, merchants, professional men and others in rural directions. In some of the older states the advance has not been so great. Pennsylvania, for instance, where the number of farms has diminished in the past ten years and the improved acreage has lost ground, the average price per acre of land and buildings was $55.79 in 1910, compared with $46.37 in 1900, showing a gain of 25 per cent. In Indiana the average value per acre of farm land with buildings increased 92 per cent. Below are some of the comparisons of representative states of the average value per acre of land with its improvements in the form of buildings, showing rates of increase in the decade:

	Total value, land & bldgs.	Per acre 1910.	Per acre 1900.	Per cent. increase.
United States	$34,681,507,000	$39.69	$19.81	100.4
So. Atlantic	2,476,152,000	32.94	11.57	106.8
South Central	4,837,353,000	19.57	8.04	143.4
Western	3,786,548,000	34.32	13.80	148.7
Illinois	3,551,194,000	108.13	53.84	101.0
Texas	1,822,713,000	16.69	5.50	204.0
Pennsylvania	1,035,300,000	55.79	46.37	20.0
Iowa	1,590,225,000	75.00	39.00	92.0
Kansas	1,733,653,000	40.07	15.45	159.0
Minnesota	1,259,510,000	46.00	26.00	77.0
New York	1,176,222,000	53.47	39.21	36.0
California	1,448,560,000	51.95	24.56	112.0
Georgia	477,603,000	17.78	6.95	156.0

These records of increase in the average value of lands, improved with buildings, are at least proof that the past decade has not been wholly unprofitable to those who invested their capital in land. With few exceptions the rate of increase has been over 100 per cent. It may be said that there is some element of speculative values in the total of $34,681,507,000. But, on the contrary, prices of farm products rather than competitive buying for speculative ends, are responsible for the rapid growth in the market value of lands and buildings. The prosperity of agriculture, in contrast with manufacturing, transportation and mining, may well command a portion of the available surplus under existing conditions of investment. As a result, lands should tend higher rather than lower, excepting in the cotton belt, where the big crop tends temporarily at least to check advances.—*Wall Street Journal.*

The Railway Traffic Manager.

The following is abstracted from an article by Franklin K. Lane, Interstate Commerce Commissioner, in *The California Outlook:*

There is in theory a minimum below which the traffic manager cannot fix the rate, and that minimum is the actual cost of transportation. Any return above this is a profitable rate. This is the American theory of rate-making upon which almost one-quarter of a million miles of road have been built which yield annually a gross return of more than $2,000,000,000.

Because of the latitude which he enjoys in fixing a rate and the effect which such rates have upon the rise and growth of communities, it is not a figure of speech, and in no sense an exaggeration, to say that the American traffic manager is the most powerful and important factor in the internal economy of the United States. He is a statesman. His policy more certainly tends to determine the character of a community than the policy of any legislature. It is more essential to the business interests of a community that he should consider its welfare than it is that its laws should be equitable or their enforcement prompt and certain, for he has it within his power to raise a city into being by the preference of a locality, or by discrimination to deny to the most naturally favored locality the power to rise out of villagehood. He can determine what kind of fuel shall be used upon the farm and in the city, what margin of profit the orange grower of California or the wheat raiser of the Dakotas shall enjoy.

John Smith invents a kind of pipe which for irrigation plants, mining purposes, and similar uses, is preferable to any other pipe on the market, and can be produced for less than any other. He establishes his plant near the source of material where his competitors have their plant; but by a classification which makes a rate, he finds himself unable to lay down his pipe at the point of demand in competition with the pipe of his rival, and after years of struggle is compelled to sell his plant for a tithe of what it cost and under a new classification soon sees his plant develop into a great industry after it is in the hands of his late rival.

One city enjoys the privilege of stopping a raw product while in transit and converting it into a finished product while it is on its journey, and thus becomes a great manufacturing center. The government expends millions to render a city accessible by water, and a railway by an adjustment of its rates contravenes the intention of the government.

It is a constant and a growing surprise that this vast power has been exercised as beneficently as it has. When we consider the tens of millions of railway rates that are in force and are used each day, and upon which turn to so great an extent the welfare of individuals and communities, it is a matter of wonder that there is not much greater complaint of favoritism, discrimination and unfairness than is now made.

Manifestly, however, such power should not be permitted to go unrestrained. The railway must get business; it must have freight to handle; and it may be to the interest of that corporation itself—that its own best interest immediately will lie in a rate policy which will be unjust. Therefore, it is not to be said that the self-interest of the railway alone will surely lead to a wise and fair schedule of rates. The law of the United States gives to the traffic manager of a railway the power to fix the charge . . . and it is as binding and absolute as if the rate itself had been incorporated into a statute and passed by Congress and approved by the president of the United States.

Here is a power, then, vested in a traffic official not only to make a rate, but to make a rate that is a law from which there can be no deviation without incurring the penalty of fine or imprisonment.

To protect the community, the shipper and the railway are denied the right to agree upon any different rate, or to accept or pay a different rate from the one published with the commission. To protect the railway the shipper is prohibited from even so much as asking any rate other than that legally filed. And the burden is placed upon both shipper and railway to know what the rate is and adhere thereto.

The railway makes its own rate subject to no limitation or restriction except those found in the act to regulate commerce, that such rates shall be reasonable, nondiscriminatory under like conditions and circumstances, and that the rates shall be made to meet the requirements of the long and short haul clause. . . . What has been done to safeguard against arbitrary and unwise exercise of so vast and unlimited power? A commission has been created whose judgment may intervene between that of the public and that of the railways, which intervention, however, shall be subject to the review of the courts under the guarantees of the Constitution against taking property without due process of law and confiscation. The commission may regulate what has been done. It is not a creative body. It cannot initiate rates. It may not say, as may the English commission, that a railway is exceeding its legal maximum, because no such maxima have been fixed in our law. It may, however, withhold its approval of an individual rate or of a schedule of rates, before such rates go into effect, as may the commission of Canada. Its function is to correct an abuse of power.

It is unfortunate that railway men have not yielded more gracefully to the imperative demand of the people for effective regulation, but this I take to be but another evidence of the extreme conservatism of the American people. We have been raised under a philosophy which taught that governmental interference with the individual will was tyranny. Our land has been so abundant, the opportunities have been so many, that we have come readily to believe in our inalienable right to do as we please.

It is within the power of the railways themselves to avert hostile legislation and insure to themselves entirely fair treatment. It is not to be expected that a railway, touching the people from so many directions and so intimately affecting their industrial life, can always avoid criticism, or that so great an enterprise can, no matter how earnest the desire of its officials, avoid mistakes which give just reason for complaint, but the spirit of the present law is based upon the theory that the railway can, if it will, deal honestly and fairly by the people, and that the foundation for complaint will be so slight that it will be within the power of a comparatively small number of government officials to bring about just and equitable treatment for the tens of thousands of communities in this country and our multitudinous industries.

The contest over rate regulation has been a democratic movement, and after a protracted struggle of twenty-five years the government may be said to have finally proved two things—that it could control these common carriers and that it intended to. To say this is to say much. How powerful the influences against regulation have been no one can say. It has been recognized that the battle over railway regulation was a test of strength between the people and organized wealth, and there has come to the people a new faith in our government, a greater confidence in its future and less impatience with existing conditions, because it has been believed that in this one matter the welfare of the public has gained a victory.

How successful the regulation of privately owned railways will prove is still a problem. We must feel our way down to some fundamental laws by which to test the traffic manager's judgment. Sydney Brooks, perhaps the greatest of present writers on economics, thinks that Europe would not have taken to government ownership if the plan of regulating by commission as we have it in the United States had been earlier discovered. It must be remembered by those who advocate government operation that they do not by this means escape governmental regulation. The control of rates must rest somewhere, and those rates cannot be fixed by some merely mechanical rate. Under government ownership, as under private ownership, there must be rate regulation; personal judgment must have its play as well as economic law.

. . . To be just to the stockholders, however, does not mean that injustice must be done the public. The traffic manager may not ask all that the traffic will bear without doing his railway in the end a great wrong, nor can the shipper hope to have lasting benefit from any injustice done to those who have put their money at the public service.

Encouraging Agricultural Development on the Santa Fe.

The Atchison, Topeka & Santa Fe now employs four agriculturists—two for New Mexico, with headquarters at Albuquerque, and two for northern Texas, with headquarters at Amarillo—whose duty it is to instruct the farmers along the line of the road in better farm methods. Under the supervision of these men experiments with various crops are also being carried on by the farmers, the amount of land devoted to a single crop by one farmer usually varying from one half to sometimes two or three acres. Frequently there are ten to fifteen farmers in a given district carrying on the work, and it is arranged so that no one has more than four or five acres in all devoted to the experimental work. The road furnishes seed to carry on the experiments and if the farmer does not have the right kind of implements it also furnishes these. The railway agriculturists, who have to cover considerable territory, are provided with automobiles so that they can satisfactorily supervise the work.

Car Surpluses and Shortages.

Arthur Hale, chairman of the committee on relations between railways of the American Railway Association in presenting statistical bulletin No. 105-A, giving a summary of car shortages and surpluses by groups from June 22, 1910, to October 25, 1911, says:

"The surplus and shortage figures reported for the period ending October 25, 1911, show a surplus of 39,306 cars and a shortage of 18,774 cars, leaving a net surplus of 20,532 cars. Every class of car (flat cars excepted), shows a decided decrease in the number of idle cars. The largest decrease is shown in coal cars, that class of car decreasing from 19,543 cars on October 11, 1911, to 12,148 cars on October 25, 1911, a decrease of 7,395 cars. During the same period box cars show a decrease of 5,206 cars and miscellaneous cars decreased 6,492 cars, which together with an increase of 17 flat cars make a total decrease of 19,076 cars for that period.

"Of the increase of 5,817 cars reported in the total shortage, it will be noted that the box car shortage is the greatest, increasing from 10,090 cars on October 11, to 14,943 cars on October 25, an increase of 4,853 cars or 48.09 per cent. Coal cars show an increased shortage of 766 cars, and miscellaneous cars an increased shortage of 385 cars, while the flat car shortage decreased 187 cars."

The accompanying table gives surpluses and shortages by groups for the last period covered by the report, and the charts show total bi-weekly surpluses and shortages in 1907 to 1911.

Total Revenues and Expenses in August.

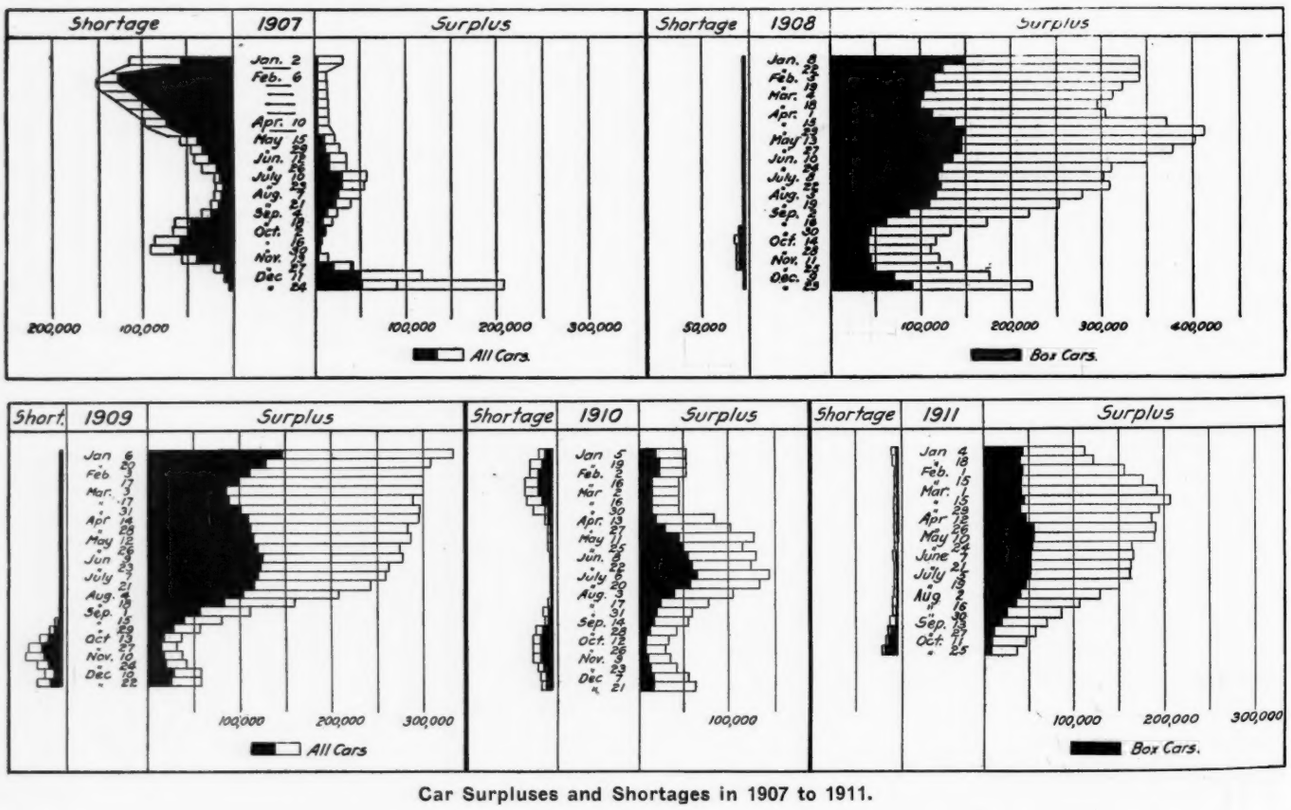
Logan G. McPherson, director of the Bureau of Railway Economics in the summary of revenues and expenses of steam roads in the United States for the month of August, 1911, says:

"The railways whose returns are included in this bulletin operated 220,228 miles of line, or 90 per cent. of all the steam railway mileage in the United States. The total operating revenues for the month of August, 1911, amounted to $237,643,752. This includes revenues from freight and passenger traffic, from carrying mail and express, and from miscellaneous sources. Compared with August, 1910, these total operating revenues show a decrease of $1,558,811. Operating revenues per mile of line amounted to $1,079, as compared with $1,101 in August, 1910. This represents a decrease of $22 per mile, or 2.0 per

CAR SURPLUSES AND SHORTAGES.

Date.	No. of roads.	Surpluses: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.	Shortages: Box.	Flat.	Coal, gondola and hopper.	Other kinds.	Total.
Group *1.—October 25, 1911	7	84	631	469	317	1,501	840	119	300	9	1,268
" 2.— " 25, 1911	23	545	88	939	1,132	2,704	547	0	153	39	739
" 3.— " 25, 1911	24	214	219	4,627	1,445	6,505	1,859	0	465	211	2,535
" 4.— " 25, 1911	10	211	74	751	819	1,855	1,194	141	954	2	2,291
" 5.— " 25, 1911	17	216	121	550	1,084	1,971	543	118	50	0	711
" 6.— " 25, 1911	24	4,077	645	1,465	3,367	9,554	131	0	102	0	233
" 7.— " 25, 1911	3	15	26	35	421	497	121	0	0	0	121
" 8.— " 25, 1911	17	6	108	1,027	1,832	2,973	2,417	152	254	66	2,889
" 9.— " 25, 1911	12	1,325	437	574	694	3,030	300	0	0	0	300
" 10.— " 25, 1911	19	389	611	1,629	4,114	6,743	3,092	163	0	162	3,417
" 11.— " 25, 1911	5	84	901	82	906	1,973	3,899	203	0	168	4,270
Total	161	7,166	3,861	12,148	16,131	39,306	14,943	896	2,278	657	18,774

*Group 1 is composed of New England lines; Group 2—New York, New Jersey, Delaware, Maryland, and Eastern Pennsylvania lines; Group 3—Ohio, Indiana, Michigan and Western Pennsylvania lines; Group 4—West Virginia, Virginia, North and South Carolina lines; Group 5—Kentucky, Tennessee, Mississippi, Alabama, Georgia and Florida lines; Group 6—Iowa, Illinois, Wisconsin, Minnesota and the Dakotas lines; Group 7—Montana, Wyoming and Nebraska lines; Group 8—Kansas, Colorado, Missouri, Arkansas and Oklahoma lines; Group 9—Texas, Louisiana and New Mexico lines; Group 10—Oregon, Idaho, California and Arizona lines; Group 11—Canadian lines.



Car Surpluses and Shortages in 1907 to 1911.

cent. This decrease in operating revenues was due wholly to a decrease in freight revenue amounting to $25 per mile, or 3.4 per cent. There were small increases in the other revenue accounts.

"Operating expenses, which include all the costs of maintaining track and equipment, operating trains, securing traffic, and of administration, amounted to $153,655,921. This was $1,251,053 less than for August, 1910. Operating expenses per mile amounted to $698, compared with $714 in August, 1910. This represents a decrease of $16 per mile, or 2.2 per cent., which was due to decreases in all the primary operating expense accounts except that of maintaining equipment. In the cost of maintaining way and structures, i. e., track and buildings, there was a decrease compared with August, 1910, of $9 per mile, or 5.6 per cent., while the cost of conducting transportation declined $7, or 1.9 per cent.

Net operating revenue, which is total operating revenues less operating expenses, shows a decrease as compared with August, 1910, of $7 per mile, equivalent to 1.8 per cent. By cutting down operating expenses the railways have been able partially to overcome the decrease of $22 per mile in operating revenues. Operating expenses have been decreased in large measure, as was the case in July, by reducing the amount spent for maintaining way and structures. The net revenue for each mile of line for each day of August averaged $12.30, as compared with $12.52 for August, 1910. It should be recalled that net revenue is gross profit before anything has been taken out for taxes, rentals, interest on bonds, appropriations for betterments, or dividends. Taxes for the month of August amounted to $9,105,655, or $41 per mile, an increase of 5.9 per cent. over August, 1910. The operating ratio for August, that is, the per cent. of the total operating revenues which was absorbed in operating expenses, was 64.7 per cent., as compared with 67.9 per cent. in July, 1911, and 64.8 per cent. in August, 1910.

"The western group of railways show a decrease in total operating revenues per mile as compared with August, 1910, of 5.9 per cent. and the eastern group a decrease of 0.1 per cent., while the operating revenues per mile of the southern group increased 4.3 per cent. over August, 1910. Operating expenses per mile were reduced 3.2 per cent. by the western railways as compared with August, 1910, and by the eastern railways 2.6 per cent., but increased on the southern railways 3.8 per cent. The cost of maintenance of way and structures shows a decrease per mile in every group in comparison with August, 1910. Net operating revenue per mile in the western group declined 10.2 per cent. as compared with August, 1910, while that of the eastern group increased 4.8 per cent., and that of the southern group 5.2 per cent. Taxes increased in all the groups as compared with August, 1910, the increase per mile amounting to 9.4 per cent in the southern group, 8.7 per cent. in the eastern group, and 2.2 per cent. in the western group.

"Comparison of the returns for two months of the fiscal year 1912 with those of the corresponding months of the fiscal year 1911 shows a decrease in total operating revenues per mile of 2.1 per cent., and in net operating revenue per mile of 1.6 per cent. The considerable decrease of 11.2 per cent. in the net operating revenue per mile of the western group contrasts with increases of 5.9 per cent. in the eastern group and 6.4 per cent. in the southern group."

The following table shows the per cent. of total operating revenues consumed by each class of expenses:

Per cent. of total operating revenues.	August, 1911.	August, 1910.	Fiscal year ended June 30, 1911.	Fiscal year ended June 30, 1910.
Maint. of way and structures.	13.8	14.3	13.1	13.4
Maint. of equipment.....	14.8	14.4	15.3	15.0
Traffic expenses	2.0	2.1	2.1	2.0
Transportation expenses	31.9	31.8	35.5	33.4
General expenses	2.2	2.2	2.6	2.5
Total operating expenses.....	64.7	64.8	68.6	66.3

INTERSTATE COMMERCE COMMISSION.

The commission announces that the first hearing in its general investigation of the business of express companies will be held in New York City November 22. The commission has had 60 men examining the books of the companies in New York.

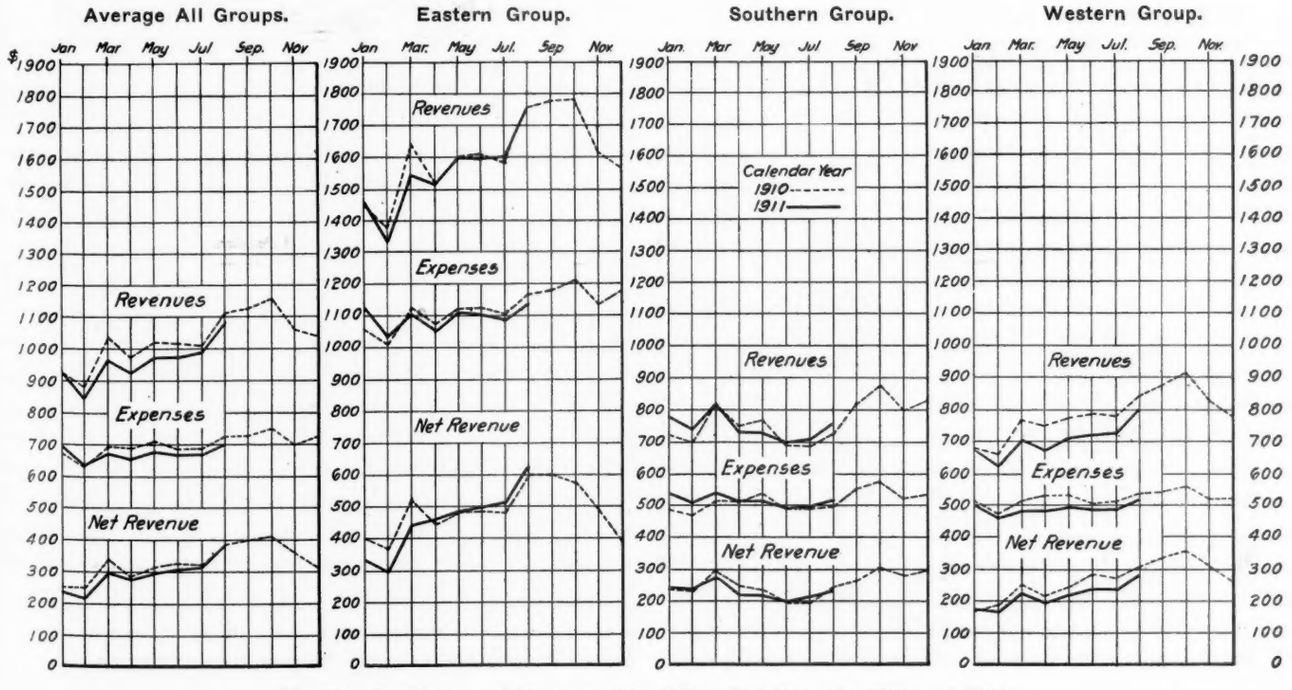
Complaint Dismissed.

C. & W. Lumber Co. v. Tallulah Falls et al. Opinion by the commission:

A rate limited to shipments for delivery within the New York lighterage limits does not apply on shipments ordered to be delivered outside of those limits. Complaint dismissed. (21 I. C. C., 463.)

H. W. Joynes et al. v. Pennsylvania Railroad. Opinion by the commission:

Complainants allege that the Pennsylvania Railroad's present track storage tariffs applicable to cars detained in its produce yards at Pittsburgh, Pa., are unreasonable and unduly prejudicial because of failure to provide for certain exemptions from the charges therein prescribed. Reaffirming *Wilson Produce Co.* v. *P. R. R. Co.*, 14 I. C. C., 170, the complaint is dismissed. (21 I. C. C., 458.)



Monthly Earnings and Expenses Per Mile of Railway in 1910 and 1911.

Barred by Statute of Limitations.

Standard Oil Co. v. Chicago Terminal Transfer et al. Opinion by the commission:

Complaint asks reparation on account of alleged unreasonable charges for transportation of eight carloads of petroleum oil from Whiting, Ind., to Bear Springs, Tenn. Shipments were delivered more than two years before complaint was filed. (21 I. C. C., 460.)

STATE COMMISSIONS.

The Pennsylvania Commission announces that it is going to make a thorough investigation of suburban fares to and from Philadelphia.

The Indiana commission is preparing to try a case in the Hammond Superior Court against the Grand Trunk to collect a penalty for failure to comply with the Block Signal Law of 1907.

The Railroad Commission of Louisiana is now holding hearings on the question of abolishing all concentration charges allowed on shipments of cotton seed to cotton seed mill points in Louisiana, and of establishing flat rates without refunds.

COURT NEWS.

Judge Anderson in the Federal Court at Indianapolis has assessed penalties totaling $7.25 against the Pennsylvania (Southwest) on its admission of violating the Hours of Service Act by keeping twenty-two employees on duty more than sixteen hours. The employees were trainmen on trains engaged in interstate commerce.

In the appelate division of the supreme court of New York, November 3, a decision was rendered affirming the judgment of the lower court for damages for the loss of money by a passenger. Joseph A. Knieriem recovered from the New York Central for the loss of $1,800 which he carried in his pocket and which was lost when the train in which he was riding was derailed and wrecked by a washout. The passenger was soon going, with his wife, on a long journey; and the court seems to have held that $1,800 was a reasonable sum of money for him to carry. But there was a strong dissenting opinion, by Judges Ingraham and McLaughlin, who held that the journey on which the passenger had started was really a short one; he had not actually begun the long journey.

Judge William C. Hook of the federal court at Kansas City, Mo., on November 1 refused to grant an injunction asked by 13 Missouri railways to restrain the state railway commission from putting into effect its reduced rates on iron and steel products. He said such an injunction would be illegal unless two other United States judges concurred in granting it, and set November 10 as the date for the next hearing. He stated that if two other judges could be obtained who would sit with him on that date he would issue the injunction to become effective when their signatures could be secured. Attorneys for the roads refused to agree to keep an account of the totals in rate differences until the injunction should be indorsed by two other judges, under which provision representatives of the state and of the shippers said they would be willing to have it granted.

The Indiana supreme court, in the case of the state against the Louisville & Nashville, has held constitutional the law of that state requiring railways to equip their engines with automatic bell-ringing devices. The decision reverses the decisions of several circuit courts in the state which declared the law unconstitutional. The railway alleged the law to be unconstitutional because it attempted to control the construction of locomotives to be used in interstate service and that the words "efficient" and "proper," used in describing the kind of device required, were indefinite, and further, that there was no such thing as an automatic bell-ringing device. The supreme court held that the company need not use the automatic ringing device in other states. The court said it has judicial knowledge that there are automatic bell ringers, and that the law was not invalid on the ground of uncertainty. The words "efficient," "proper" and "properly" applied to the automatic bell ringer, means that the device which may be chosen shall be effective to continually ring the bell.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Mrs. S. A. Kidder, president of the Nevada County Narrow Gage Railroad, with office at Grass Valley, Cal., has resigned.

Arthur P. Foss, auditor of disbursements of the Maine Central at Portland, Me., has been appointed assistant controller, with office at Portland; Albert J. Raynes, succeeds Mr. Foss.

W. L. Alexander, general claim agent of the Gulf, Colorado & Santa Fe at Galveston, Tex., has been appointed general claim agent of the Missouri, Kansas & Texas of Texas, with office at Texas.

C. E. Wright, assistant freight auditor of the Chicago, Milwaukee & St. Paul, has been appointed auditor of the Copper Range, with office at Houghton, Mich., succeeding Wallace Tedford, assigned to other duties.

John S. Douglas, claim adjuster for the Gulf, Colorado & Santa Fe at Cleburne, Tex., has been appointed acting general claim agent, with office at Galveston, Tex., succeeding W. L. Alexander, resigned to accept service with another company.

C. B. Seger, general auditor of the Southern Pacific, the Union Pacific, the Oregon Short Line, the Oregon-Washington Railroad & Navigation Company, the Southern Pacific of Mexico, the Sonora Railway and the Arizona Eastern at Chicago, has been elected deputy comptroller, with office in New York City.

The following officers of the Galveston, Harrisburg & San Antonio and the Texas & New Orleans have been appointed to similar offices on the Houston & Texas Central and the Houston East & West Texas, with office at Houston, Tex.; D. B. Keiser, car accountant; F. J. Cox, assistant auditor, and W. E. Briggs, freight auditor. They will continue to have jurisdiction over the Galveston, Harrisburg & San Antonio, but these offices have been abolished on the Texas & New Orleans.

Referring to the changes in jurisdiction of officers of the Southern Pacific, it was stated in our issue of October 27 that W. H. Bancroft, who has heretofore been general manager of the Southern Pacific lines east of Sparks, will hereafter devote all of his time to the Oregon-Washington Railroad & Navigation Company. This was erroneous, as Mr. Bancroft has not been connected with the latter company, but has long been vice-president and general manager of the Oregon Short Line, and he will in future devote his time to this road and to the San Pedro, Los Angeles & Salt Lake, of which he is first vice-president.

William H. Bruce, whose appointment as secretary and treasurer of the Atlanta & West Point and the Western Railway of Alabama, has been announced in these columns, was born on December 28, 1866, at Nashville, Tenn., and graduated from the Atlanta, Ga., High School in 1884. He began railway work in October of the same year as a clerk in the general freight office of the Atlanta & West Point and the Western Railway of Alabama, at Montgomery, Ala., and was appointed secretary to the president and general manager of the same roads in 1886. From 1891 to 1892 he was secretary to the third vice-president of the Louisville & Nashville at Nashville, Tenn., and then, for three years, was secretary to August Belmont, chairman of the board of the Louisville & Nashville. In 1896, Mr. Bruce was appointed assistant to the president of the Louisville & Nashville Terminal Company at Nashville, and since 1901 he was assistant secretary of the Louisville & Nashville at Louisville, Ky.

P. J. Flynn, whose election as vice-president of the Delaware Lackawanna & Western, in charge of traffic, has been announced in these columns, was born March 12, 1856, at Granville, N. Y., and began railway work in 1870 with the Philadelphia & Reading. He was later in the telegraph and traffic departments of several small railways and in January, 1880, he was appointed station agent of the Atchison, Topeka & Santa Fe, at Trinidad, Colo. Three years later he was made geenral agent of the same road at Salt Lake City, Utah, and was later transferred to Cincinnati, Ohio, and then to Denver, Colo. From November, 1887, to August, 1889,

he was general agent and assistant superintendent in charge of Denver Terminals, including the Denver Circle Railway, and division of the Atchison, Topeka & Santa Fe, at Denver. He was oppointed general western freight and passenger agent of the Missouri Pacific in August, 1889, and the following April was made general freight and passenger agent of the Rio Grande-Midland route, composed of the Colorado Midland and Denver Rio Grande and Rio Grande Western lines, with office at Denver. From April, 1891, to September, 1899, he was commissioner of the Colorado-Utah Traffic Association, Denver, Texas & Fort Worth Association and Local Utah Railway Association, and from January, 1892, to September, 1899, he was chairman of the Colorado Passenger Association. Mr. Flynn was appointed general freight agent of the Delaware, Lackawanna & Western in September, 1899, and since March, 1903, was freight traffic manager of the same road at New York.

In an article on the reorganization of the Harriman Lines in the *Railway Age Gazette* on October 6, we published an account of the life of Epes Randolph, the new president of the Southern Pacific Lines in Mexico. The photograph of Mr. Randolph reproduced herewith, was not received in time to be published with the photographs of the other Harriman Lines officers shown in the article mentioned above. Mr. Randolph's first important railway work was as an engineer on eastern railways controlled by Collis P. Huntington. He has been in the southwest since 1894, serving in various positions on Harriman Lines, particularly those in which his engineering ability was most needed, such as the development and protection of the Imperial valley and the extension of the Southern Pacific lines into Mexico.

Epes Randolph.

Operating Officers.

C. J. Burkholder, trainmaster of the Kansas City Southern at Pittsburg, Kans., has been appointed superintendent, with office at Pittsburg, succeeding O. Cornelison, resigned to go to the Virginian Railway.

W. W. Collins, superintendent of the Iowa and Dakota division of the Chicago, Milwaukee & St. Paul at Mason City, Iowa, has been appointed also superintendent of the Black Hills division, with office at Mason City. R. P. Edson, superintendent at Murdo Mackenzie, S. D., has been appointed assistant superintendent of the Iowa and Dakota division west of Sanborn and of the Black Hills division, with office at Mitchell, S. D. The jurisdiction of A. C. Peterson, assistant superintendent at Mason City, will hereafter be over the lines east of and including Sanborn, and the office of trainmaster has been abolished.

H. C. Bixler, trainmaster of the New York terminal division of the Pennsylvania Railroad, has been promoted to assistant superintendent of the Philadelphia Terminal division. He will have charge of the passenger service in and out of Philadelphia. Mr. Bixler was born at Broad Ford, Pa., on March 21, 1868, and entered the service of the Pennsylvania Railroad as a telegraph operator on the Pittsburgh division on May 17, 1887. In December, 1892, he was promoted to extra train despatcher of the same division, and on April 1, 1893, was made train despatcher. On June 1, 1903, he was promoted to assistant trainmaster of the Pittsburgh division, which position he held until November 1, 1909, when he was transferred to the New York Terminal division as trainmaster, in charge of the train service on the company's New York improvement and tunnel extension.

Stanley Saunders Russell, whose appointment as superintendent of car service of the Central Vermont, with headquarters at St. Albans, Vt., has been announced in these columns, was born October 18, 1874, at Rednersville, Ont., and was educated in the public schools and at Belleville College. He began railway work in November, 1891, in the office of the assistant superintendent of the Grand Trunk at Belleville, and the following year was transferred to Toronto. In August, 1896, he was appointed secretary to the superintendent at Toronto, and in March, 1898, he became chief clerk to the joint superintendent of the Grand Trunk and the Wabash, at St. Thomas. From June to December, 1902, he was private secretary to the general manager of the Central Vermont at St. Albans, and from January, 1903, to December of the following year was chief clerk to the superintendent of transportation, and then became chief clerk to the general manager, which position he held at the time of his recent appointment as superintendent of car service, as above noted.

Following the recent reorganization of the Harriman Lines, a change has been made by which all the old lines of the Southern Pacific go back to the Southern Pacific Company, Pacific system, and the Pacific system, which has heretofore been divided into the Northern and Southern districts, has been redistricted. Under the new plan the Northern district will embrace the lines in Oregon (which will hereafter be known as the Portland division) and the Shasta division. The Central district will comprise the Western, Coast, Stockton, Sacramento and Salt Lake divisions, being the same as the old Northern district except that the Shasta division has been taken from it and the Salt Lake division (heretofore under the jurisdiction of officers of the Oregon Short Line, and known as the "lines east of Sparks") has been added to it. The Southern district will continue as in the past to include the Los Angeles, San Joaquin and Tucson divisions. D. W. Campbell, assistant general manager in charge of maintenance and operation of the Second district of the Oregon-Washington Railroad & Navigation Company, at Seattle, Wash., has been appointed general superintendent of the Northern district of the Southern Pacific, with office at Portland. Officers of the old Northern district will hereafter have jurisdiction over the Central district.

Grant Hall, who has been appointed assistant general manager of the western lines of the Canadian Pacific, with office at Winnipeg, Man., as has been announced in these columns, was born November 27, 1863, at Montreal, Can., and was educated at Bishops College and School, Lennoxville, Que. He began railway work as an apprentice machinist with the Grand Trunk at Point St. Charles shops, Montreal, in 1883. He was locomotive foreman on the Canadian Pacific from 1887 to 1893, when he was made general locomotive foreman of the Intercolonial Railway, with office at Moncton, N. B., where he remained for five years. In September, 1898, he returned to the Canadian Pacific, where he was consecutively general foreman, first at the McAdam and later at the Winnipeg shops; master mechanic of the British Columbia division; assistant superintendent of motive power of the eastern lines, and superintendent of motive power and car department of the western lines, from which last office he has just been promoted.

Grant Hall.

Traffic Officers.

B. A. Rockwell has been appointed assistant division freight agent of the Erie Railroad, with office at New York City.

For notice of the appointment of milk agent and assistant milk agent, of the Pennsylvania Railroad, see an item under Traffic News.

J. F. Barber has been appointed traveling passenger agent of the Illinois Central, with office at Freeport, Ill., succeeding S. C. Baird, promoted.

Harry Baker, agent of the San Antonio & Aransas Pass at Corpus Christi, Tex., has been appointed commercial agent, with office at Corpus Christi.

V. B. Sharritts has been appointed acting agent of the Traders Despatch, with headquarters at Indianapolis, Ind., succeeding O. J. Hammon, resigned.

George H. Wilcox, commercial agent of the Georgia Southern & Florida, at Cincinnati, Ohio, has been appointed assistant general freight agent, with office at Macon, Ga.

Geo. F. Ramspacher has been appointed commercial agent of the Rock Island lines, with office at Philadelphia, Pa., succeeding D. W. Farrow, retired under the pension rules.

R. W. Darling has been appointed traveling passenger agent of the Cleveland, Cincinnati, Chicago & St. Louis, with office at Huntington, W. Va., succeeding M. L. Griffin, promoted.

M. C. Bradley has been appointed traveling freight agent of the Pere Marquette, with office at St. Louis, Mo., succeeding E. B. Wood, resigned to accept service with another company.

A. T. Pratt has been appointed traveling freight agent of the Texas & Pacific, with office at St. Louis, Mo., succeeding P. B. Doddridge, transferred. W. J. Lane has been appointed traveling freight agent, with office at Los Angeles, Cal.

J. J. Livingston, traveling agent of the Chicago & North Western at Kansas City, Mo., has been appointed traveling agent, with office at Chicago, succeeding Clinton McCullough, promoted, and his former position has been abolished.

The following have been appointed agents of the new Frisco Refrigerator Line, which began operations on November 1: E. P. Lannan, general agent at St. Louis, Mo.; I. T. Preston, agent at New Orleans, La.; and C. E. Pierce, agent at Chicago.

D. L. Moorman, traveling passenger agent of the Cincinnati, Hamilton & Dayton at Dayton, Ohio, has been appointed traveling passenger agent at Toledo, Ohio, succeeding J. R. McCord, granted a leave of absence on account of ill health. L. H. McArthur, agent at Hamilton, Ohio, succeeds Mr. Moorman.

G. H. Westcott, commercial agent of the Chicago, Milwaukee & St. Paul at Buffalo, N. Y., has been appointed division freight agent, with office at Chicago, succeeding A. A. Wilson, appointed commercial agent, with office at Milwaukee, Wis. G. E. Chase, traveling passenger agent at Buffalo, N. Y., succeeds Mr. Westcott.

J. L. Martin, traveling freight agent of the Southern Railway, at Cincinnati, Ohio, has been appointed a freight soliciting agent, with office at Louisville, Ky., succeeding William Humphreys, whose appointment as commercial agent at Dallas, Tex., has already been announced in these columns. H. E. Woodworth, freight soliciting agent at Nashville, Tenn., succeeds Mr. Martin.

M. C. Browning, traveling freight agent of the Louisville & Nashville at Detroit, Mich., has been appointed commercial agent, with office at Cleveland, Ohio, succeeding A. E. Mann, whose promotion to general agent at St. Louis has been announced in these columns. F. A. McHale, traveling freight agent at Louisville, Ky., succeeds Mr. Browning, and Q. D. Butler succeeds Mr. McHale.

R. D. Williams, district passenger agent of the Union Pacific at Denver, Colo., has been appointed city passenger agent of that road, the Oregon Short Line, the Oregon-Washington Railroad & Navigation Company and the Southern Pacific, with office at Chicago, succeeding B. H. Bullard, resigned. H. E. Hill, traveling passenger agent of the Union Pacific at Denver, succeeds Mr. Williams with the title of city passenger agent, and John J. Craron succeeds Mr. Hill as traveling passenger agent.

C. A. Russell, commercial agent of the Southern Railway at Johnson City, Tenn., has been appointed commercial agent at Charlotte, N. C., succeeding C. V. Palmer, resigned to go to another company. A. W. Mays, traveling freight agent at Knoxville, Tenn., succeeds Mr. Russell, and S. B. Douglass succeeds Mr. Mays. J. B. Garvey, traveling freight agent at New Orleans, La., has been appointed freight soliciting agent with office at New Orleans, succeeding J. R. Barnwell, resigned. W. S. Voorsanger, traveling freight agent at Dallas, Tex., succeeds Mr. Garvey, and W. T. Keating has been appointed traveling freight agent at Dallas, succeeding R. D. Tate, resigned.

Incident to the redistricting of the Southern Pacific (see item under Operating Officers), J. M. Scott, assistant general passenger agent of the Oregon-Washington Railroad & Navigation Company, and the Southern Pacific lines in Oregon at Portland, Ore., has been appointed general passenger agent of the Northern district of the Southern Pacific, with office at Portland. H. E. Lounsbury, assistant general freight agent of the Oregon-Washington Railroad & Navigation Company and the Southern Pacific lines in Oregon at Portland, has been appointed general freight agent of the Northern district of the Southern Pacific, with office at Portland. Officers of the old Northern district of the Southern Pacific will hereafter have jurisdiction over the Central district.

C. B. Compton, traffic manager of the Louisville & Nashville, at Louisville, Ky., has been appointed to the new position of freight traffic manager and his former position has been abolished. W. A. Russell, general passenger agent at Louisville, has been appointed to the new position of passenger traffic manager and Robert D. Pusey, assistant general passenger agent, succeeds Mr. Russell, all with offices at Louisville, and John K. Ridgely, division passenger agent at New Orleans, La., has been appointed assistant general passenger agent, with headquarters at New Orleans, with authority over the lines south of and including Birmingham, Ala. L. G. Waldrop, general agent at Sheffield, Ala., has been appointed general agent at Anniston, succeeding H. P. Salter, promoted; S. B. Jones, succeeds Mr. Waldrop.

Engineering and Rolling Stock Officers.

T. S. Lloyd, superintendent of motive power and equipment of the Delaware, Lackawanna & Western, with office at Scranton, Pa., has resigned, effective at the pleasure of the management, and the selection of his successor.

D. C. King, roadmaster of the Fort Worth & Rio Grande and the St. Louis, San Francisco & Texas at Brownwood, Tex., has been transferred to Fort Worth, Tex., succeeding J. S. Beck, resigned to go with the St. Louis Southwestern at Dallas, Tex.

V. M. Robinson, foreman in the car department of the Missouri Pacific at De Soto, Mo., has been appointed general car foreman of the Trinity & Brazos Valley, with office at Teague, Tex., succeeding W. R. Duff, resigned to accept service with another company.

John G. Sullivan, who has been appointed chief engineer of the western lines of the Canadian Pacific, with office at Winnipeg, Man., as has been announced in these columns, was born June 11, 1863, at Bushnells Basin, Monroe county, New York. He finished his education at Cornell University, which he attended from 1884 to 1888, and began railway work as a rodman on the Great Northern in the latter year. The following year he went with the Spokane Falls & Northern, now part of the Great Northern, as instrument man and assistant engineer; and was then consecutively, assistant engineer on the Great Northern; assistant engineer with the Alberta Railway & Coal Company, now the Alberta Railway & Irrigation Company; locating engineer with the Butte, Anaconda & Pacific; principal assistant engineer of the Kaslo & Slocan, now the Kootenay Railway & Navigation Com-

J. G. Sullivan

pany, and from 1896 to 1900 he was with the Columbia & Western, now part of the Canadian Pacific, first as reconnaissance engineer and later as principal assistant engineer in charge of construction and operation. He was then for five years with the Canadian Pacific proper as division engineer in charge of all new construction on the western lines. He was assistant chief engineer on the Panama canal from September, 1905, to January, 1907, and then returned to the Canadian Pacific, where he was manager of construction of the eastern lines until September, 1908. He was appointed assistant chief engineer of the eastern lines in the latter month, and from February, 1911, until the time of his promotion as above he was assistant chief engineer of the western lines at Winnipeg.

J. A. Roland, roadmaster of the Chicago & North Western at Sioux City, Iowa, has been appointed roadmaster, with office at Missouri Valley, Iowa. A. W. Allstrand, roadmaster at Carroll, Iowa, succeeds Mr. Roland; and L. Gilbert, section foreman at Sioux City, succeeds Mr. Allstrand.

T. W. Younger, master mechanic of the Southern Pacific lines in Oregon at Portland, Ore., has been appointed superintendent of motive power of the Northern district of the Southern Pacific, with office at Portland. F. L. Burckhalter, division engineer at Los Angeles, Cal., has been appointed district engineer of the Northern district, with office at Portland. (See item under Operating Officers.)

Purchasing Officers.

V. P. Adrian has been appointed division storekeeper of the Missouri, Kansas & Texas, with office at Denison, Tex., succeeding J. F. Slaughter, resigned to accept service with another company.

J. F. Slaughter, division storekeeper of the Missouri, Kansas & Texas at Denison, Tex., has been appointed division storekeeper of the Wichita Falls & Northwestern, with office at Wichita Falls, Tex.

W. J. Given, has been appointed division storekeeper of the Mobile & Ohio, with office at Whistler, Ala., succeeding W. O. Williamson, resigned, and P. E. Keller has been appointed division storekeeper at Tuscaloosa, Ala., succeeding J. J. Tomlinson, resigned.

A. E. Hutchinson, general purchasing agent of the Oregon Short Line and the Southern Pacific lines east of Sparks at Salt Lake City, Utah, has been appointed purchasing agent of the Northern district of the Southern Pacific, with office at Portland, Ore. (See item under Operating Officers.)

OBITUARY.

J. P. Spivey, superintendent of the Kansas City Southern demurrage bureau, died in Kansas City, Mo., on October 31. He was 39 years old.

Dr. Thomas M. Colley, formerly chief surgeon of the International & Great Northern at Palestine, Tex., died at Houston, Tex., on October 30, at the age of 76 years.

H. Victor Newcomb, formerly for several years vice-president of the Louisville & Nashville, died on November 3, at Atlantic City, N. J. Thirty years ago Mr. Newcomb was one of the well-known operators in Wall street. He was born in Louisville, Ky., in 1844. In 1874 he was chosen vice-president, and in 1879 succeeded his father as president of the Louisville & Nashville. He held that office about two years. Mr. Newcomb retired from active business life several years ago. He was a direct descendant of Martha Washington.

William H. Flynn, formerly engaged in railway construction work, died at South Berwick, Me., on October 30, at the age of 68 years. Mr. Flynn was engaged in the construction of the Bangor & Piscataquis, afterward merged in the Bangor & Aroostook, a portion of the Eastern Railroad (Mass.), now part of the Boston & Maine; also in construction work on the Maine Central, Boston & Maine and Massachusetts Central, which is now part of the Boston & Maine. All this work was carried out at various places in New England. In addition, he carried out work on the Central Railroad of New Jersey and the Pennsylvania Railroad. Mr. Flynn was born in St. Andrews, N. B.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Louisville & Nashville is building 13 consolidation locomotives at its South Louisville, Ky., shops.

The Chicago & North Western has ordered one mogul locomotive from the American Locomotive Company. The dimensions of the cylinders will be 11 in. x 18 in.; the diameter of the driving wheels will be 43 in., and the total weight in working order will be 50,000 lbs.

The Chicago & Illinois Midland has ordered 1 four-wheel switching locomotive from the American Locomotive Company. The dimensions of the cylinders will be 13 in. x 18 in.; the diameter of the driving wheels will be 36 in., and the total weight in working order will be 56,000 lbs.

The Boston, Revere Beach & Lynn has ordered 2 Forney type passenger locomotives from the American Locomotive Company. The dimensions of the cylinders will be 14 in. x 18 in.; the diameter of the driving wheels will be 49½ in., and the total weight in working order will be 91,000 lbs.

The Illinois Central has ordered 40 mikado locomotives from the Baldwin Locomotive Works and 10 Pacific type locomotives from the American Locomotive Company. The dimensions of the cylinders of the mikado locomotives will be 27 in. x 30 in., the diameter of the driving wheels will be 63 in., and the total weight in working order will be 280,000 lbs.

The Akron, Canton & Youngstown, mentioned in the *Railway Age Gazette* of October 13 as being in the market for 5 switching locomotives, has ordered this equipment from the Lima Locomotive & Machine Company. Three of the locomotives will have 19 in. x 26 in. cylinders and will weigh 135,000 lbs., and the other two will have 21 in. x 26 in. cylinders and will weigh 159,000.

CAR BUILDING.

The Canadian Pacific is in the market for 10 sleeping cars.

The Armour Car Lines, Chicago, are building 400 refrigerator cars at the company's shops.

The Norfolk & Southern is making inquiries for 500 sixty-ton steel underframe ventilated box cars.

The Southern Railway has ordered 600 all-steel 50-ton gondola cars from the Pressed Steel Car Company.

The Chicago, Milwaukee & St. Paul has ordered 500 steel underframes from the Bettendorf Axle Company for reinforcing freight cars.

The Illinois Central is in the market for 30 caboose cars in addition to the equipment mentioned in the *Railway Age Gazette* of November 3.

The Lehigh Valley, mentioned in the *Railway Age Gazette* of October 6 as being in the market for 25 passenger cars, has ordered 15 all-steel combination passenger and baggage cars from the Pullman Company and 10 all-steel combination passenger and baggage cars from the Barney & Smith Car Company.

The Chicago, Burlington & Quincy, as mentioned in the *Railway Age Gazette* of November 3, has ordered 500 all-steel gondola cars from the American Car & Foundry Company. These cars will have a capacity of 100,000 lbs., and will weigh 38,500 lbs. The inside measurements will be 40 ft. long, 9 ft. 6 in. wide and 4 ft. 7 in. high. The over-all measurements will be 41 ft. 6 in. long, 10 ft. 1 in. wide, and 8 ft. 6 in. high. They will be built at the company's St. Louis, Mo., plant. The special equipment will be as follows:

Axles	American Car & Foundry Co.
Bolsters, truck	Simplex.
Brakes	Westinghouse.
Brake beams	Simplex.
Brake shoes	Safety.
Couplers	Simplex.
Draft gear	Farlow.
Journal boxes	McCord.
Side bearings	Parry.
Trucks	Andrews.
Wheels	American Car & Foundry Co.

IRON AND STEEL.

The Great Northern is in the market for 40,000 tons of rails.

The Pennsylvania is making inquiries for 2,000 tons of bridge steel for the bridge at Williamsport, Pa.

The Norfolk & Western has ordered 50,000 tons of rails from the United States Steel Corporation.

The Seaboard Air Line has ordered 200 tons of bridge steel from the Virginia Bridge & Iron Company.

The Buffalo, Rochester & Pittsburg has ordered 700 tons of bridge steel from the American Bridge Company.

The Chicago, Burlington & Quincy is in the market for from 20,000 to 25,000 tons of rails for 1912 requirements.

The Central of New Jersey is taking bids on 200 tons of structural steel for the grade separation work at Elizabethport, N. J.

The Chicago, Burlington & Quincy has ordered a 60-ft. deck plate girder, a 69-ft. 8-inch skew deck plate girder, a total weight of 368 tons, and a 30-ft. I-beam span, 121 tons, from the McClintic Marshall Construction Company.

The New York, New Haven & Hartford and the Pennsylvania, as mentioned in the *Railway Age Gazette* of November 3, have placed a contract with the American Bridge Company for the construction of the Hell Gate bridge. This contract calls for 40,000 tons of structural steel.

General Conditions in Steel.—Orders in the steel industry have shown a decided improvement during the past week. This increase is believed to be about 10 per cent. over the previous week. The Steel Corporation is booking orders at the rate of about 37,000 tons a day, or at the rate of more than 11,000,000 tons a year, and the mills are operating at about 74 per cent. of capacity. There is no immediate prospect of higher prices, for steel men are satisfied with the present level so long as the high rate of production is maintained. Orders are pending for about 100,000 tons of rails.

MACHINERY AND TOOLS.

The Lehigh Valley is making inquiries for a number of machine tools.

The Delaware, Lackawanna & Western has placed orders for a small number of machine tools and is preparing a large list for 1912 requirments.

The New York, New Haven & Hartford has issued a list of machine tools, including a number of large lathes, planers and shapers, which will probably be used in the shops at New Haven, Conn. The estimated cost is $50,000.

FOREIGN RAILWAY NOTES.

At the close of 1910 there were about 1,230 miles of government railways in Java, and about 307 miles of new line are expected to be opened in a short time. The number of passengers traveling over the government lines in 1910 was 26,439,020, with a total passenger mileage of 442,372,389.

In 1909 a German firm obtained from the Peruvian government a provisional concession to connect the port of Paita, in northern Peru, with a point open to navigation on the Amazon river in order to make to the Pacific ocean, a route of about 400 miles, for products of the Amazon region, which now have to go 2,500 miles down this river before reaching the Atlantic ocean. They then often reach the United States by way of Europe. The length of this line will be either 393 miles or 467 miles, according to which of the two available routes is chosen, and the cost is estimated at either $17,519,400, or $22,872,550. The line will have the great advantage of presenting very few serious difficulties in its construction as compared with other South American trans-Andean lines. Two of these latter in Peru now ascend to nearly 15,000 ft., while the proposed road would be able to cross the Andes at a height of not over 7,000 ft., and possibly at 5,000 ft. by tunneling.

Supply Trade News.

The Western Steel Car & Foundry Company, Chicago, will build a one-story machine shop at its Hegewisch, Ill., plant to cost approximately $32,000.

The Crawford Locomotive & Car Company, Streator, Ill., has been awarded a contract by the Detroit, Toledo & Ironton for repairing freight equipment.

D. C. & William B. Jackson, engineers, Chicago, have moved their Chicago offices from the Commercial National Bank building, to the new Harris Trust building.

The Isthmian Canal Commission will receive bids until November 22 on miscellaneous supplies, including locomotive cranes, stiff-leg derricks and hoisting engines. Circular No. 662.

Frank G. Coggin has resigned his position in the sales department of the Chicago Car Heating Company, Chicago, to go to the Ward Equipment Company, New York, with office in that city.

The Strauss Bascule Bridge Company, Chicago, has received an order from the Canadian Pacific to build a 336-ft. single-leaf, double track bascule bridge over the United States ship canal at Sault Ste. Marie, Mich.

The Power Specialty Company, New York, has received among recent orders, one from the New York, New Haven & Hartford for 10,620 h. p. Foster superheaters, to be used with Bigelow-Hornsby and Babcock & Wilcox boilers for the Cos Cob, Conn., and Bridgeport plants.

J. P. Coleman, chief engineer of the Union Switch & Signal Company, Swissvale, Pa., has been made consulting engineer of that company. L. F. Howard has been made engineering manager of the company, and F. B. Corey has resigned from his position with the General Electric Company, Schenectady, N. Y., to become engineer in charge of inspection of the Union company.

The American Steel & Wire Company, Chicago, has issued a pamphlet announcing that it has changed its standard of gages for steel wire to the new standard recently issued by the government Bureau of Standards, Washington, D. C. In the future, this company will use the name Steel Wire Gage in connection with steel wire in place of the name American Steel Wire Gage used heretofore, and for copper wire it will use the name American Wire Gage (B & S).

The Pollak Steel Company, Cincinnati, Ohio, which was recently organized, has taken over the manufacturing business of the Block-Pollak Iron Company, Cincinnati. The officials of the new company are as follows: President, Emil Pollak; vice-president, Maurice E. Pollak; treasurer and general manager, Bernard E. Pollak; secretary, Julian A. Pollak. For many years the plant, which is located at Carthage, a suburb of Cincinnati, has been given over to the manufacture of large forgings, principally car axles and other railway forgings, machine and engine builders' forgings, both light and heavy. The annual capacity of the plant has been nearly 100,000 tons, with over 50 per cent. of the total running in car axles. Improvements contemplated by the succeeding company include an addition to the present machine shop of a building 400 ft. long. A testing department will also be added for the treatment of steels, which will be equipped with annealing furnaces and all necessary apparatus. A special brand of heat-treated steels will be put on the market designed particularly for locomotive driving axles and forgings, which will meet the requirements of the specifications recently adopted by the M. C. B. association.

The Bucyrus Company, South Milwaukee, Wis., has recently been reorganized under a plan by which its authorized capital stock has been increased to $10,000,000, of which $8,000,000 has been issued. This action was taken so that some necessary additions to the plant and equipment could be made. Besides the plant at South Milwaukee, the company will own and operate the new shops, now under construction at Evansville, Ind., where wire rope shovels and chain shovels will be made. The plant site comprises 70 acres, and it is expected that 1,000 men will be employed in the new shops alone. The company now builds dredges of all sizes and types, wrecking cranes, pile drivers, drag line excavators, ballast plow unloaders and steam shovels of the heavier type, and intends to bring out a full line of light revolving shovels weighing up to 40 tons, and to take

up the manufacture of other types of earth-handling and excavating machinery. It also intends to extend its business to foreign markets, where it has not heretofore solicited trade, although its equipment has been used in a number of foreign countries. Through the banking firms of Pomroy Brothers, New York, and Edward B. Smith & Company, Philadelphia, Pa., the interest of influential stockholders in the east has been secured. The officers of the reorganized company will be as follows: President, William W. Coleman; vice-president, E. K. Swigart; secretary, G. A. Morison; treasurer, Dan P. Eells. The board of directors is made up as follows: H. P. Eells, former president of the Bucyrus Company, chairman; C. H. Cutler, president of the American Brake Shoe & Foundry Company, Mahwah, N. J.; W. H. Marshall, president of the American Locomotive Company, New York; A. H. Lockett, of Pomroy Brothers; W. W. Coleman; D. E. Pomroy, vice-president of the Bankers' Trust Company, New York; E. K. Swigart; G. W. McGarrah, president of the Mechanics and Metals National Bank, New York; H. H. Dean, of Edward B. Smith & Company; G. F. Steedman, president of the Curtis & Company Manufacturing Company, St. Louis, Mo.; J. B. Terbell, vice-president of the American Brake Shoe & Foundry Company; and Dan P. Eells.

TRADE PUBLICATIONS.

SIFTING MACHINES.—The Hanna Engineering Works, Chicago, has published a 36-page illustrated catalog describing in detail the sand-sifting machines made by that company.

LAND SHOW, NEW YORK.—One of the most interesting of the many pamphlets which are being distributed at the American Land and Irrigation Exposition, New York, is published by the Pennsylvania. This pamphlet enumerates and describes the various models and pictures exhibited by this company, and tells how they are intended to show the historical picture of the strides made by the Pennsylvania in transportation facilities, as well as to illustrate present day activities in the encouragement of agricultural development. The booklet then tells of the many efforts the company has made to promote scientific agriculture; how these efforts have been received by the farmers, and also why the company is making them. It ends with a brief account of the company's activities in conservation of timber resources.

The Wyoming State Board of Immigration, Cheyenne, Wyo., distributed bulletins on Irrigated Lands, Dry Farming and on Coal and Oil. The first bulletin tells of the enormous area that has been reclaimed by irrigation. It describes the remarkable yields secured by irrigation, and finally gives a list of irrigation projects which have been investigated by the board of immigration and have been found worthy of the confidence of the home-seeker. The bulletin on Dry Farming tells how good crops may be secured without irrigation on land where the annual rainfall is between 12½ and 15 inches. The bulletin on Coal and Oil describes the remarkable wealth of the state in these two products.

At the Denver & Rio Grande booth an attractive little folder is being distributed called The Land of Irrigation, in which many prosperous farms along the lines of this company are illustrated.

The agricultural department of the Southern Railway is distributing an interesting booklet called the Southeastern States, the Favored Region in Location, Resources, Products and Opportunities, in which some astonishing facts are given in regard to the productivity, diversity of resources and the industrial development of this region. This company has also published a booklet called Fruit and Farm Lands in the Southeast, which gives a list of farms in the states covered by the railway, briefly describing them and giving the price of each.

The passenger department of the Norfolk & Western has issued a very full booklet, entitled the Southern Home Seeker and Investor's Guide, in which interesting information is given on the localities along this company's lines.

The Massachusetts Board of Agriculture, Boston, Mass., has published a 169-page book describing Massachusetts' agricultural resources, advantages and opportunities. This book includes a very large list of farms for sale in the state, giving a full description and the price of each.

The agricultural department of the Bangor & Aroostook is distributing a small illustrated leaflet entitled Aroostook and the Potatoes That Have Made It Famous, in which the yield and exceptional quality of this crop are described.

Railway Construction.

New Incorporations, Surveys, Etc.

ALTUS LUBBOCK & ROSWELL.—This company, which is building from Memphis, Tex., southwest, has grading finished on about 80 miles and expects to have all the grading work finished between Memphis and Lubbock, 140 miles, by February 1, at which time track-laying is to be started. The line is projected from Altus, Okla., southwest via Memphis, Tex., to Roswell, N. M. Work will be finished on the division between Memphis and Roswell, 300 miles, before work is started on the section from Memphis east to Altus. The Texas Construction Company, of Memphis and Kansas City, Mo., which is backed by the Empire Construction and Finance Company, Kansas City, is building the line.

CANADIAN PACIFIC.—An officer writes that a contract has been given to Foley Bros., Welsh & Stewart, to build from Fort Steele, B. C., to Skookumchuck. J. G. Sullivan, chief engineer, Winnipeg, Man. (October 27, p. 859.)

This company will apply to the Parliament of Canada at its next session for an act authorizing it to construct the following branch lines of railway:

From a point at or near Hawarden, on its Moosejaw northwesterly branch in a northerly direction to a point at or near Floral or Cheviot, on its Pheasant Hills branch, or to a point between these two places in the province of Saskatchewan.

From a point on its Estevan-Forward branch in township 2 or 3, range 12, 13 or 14, west 2nd meridian, in a westerly and northwesterly direction to a junction with its Weyburn-Lethbridge branch in township 5 or 6, range 25 or 26, west 2nd meridian, in the province of Saskatchewan.

From a point at or near Sedgewick on its Hardisty subdivision in a southerly direction to a point in township 39 or 40, Range 11, 12 or 13, west 4th meridian, in the province of Alberta.

In a northwesterly and northerly direction from a point on its line from Wilkie, Sask., to a point near the North Saskatchewan river in township 51, 52, 53, 54, 55 or 56, range 1, 2, 3, 4, 5, 6, 7 or 8, west 4th meridian, in the provinces of Saskatchewan and Alberta.

From a point at or near Kipp on its Crow's Nest subdivision in an easterly and northeasterly direction to a point in township 12 or 13, range 12 or 13, west 4th meridian, in the province of Alberta.

From the northwesterly terminus of the line from Asquith, in a westerly and northwesterly direction to a point at or near Battleford, in the province of Saskatchewan.

From a point at or near Irricana in an easterly and southeasterly direction to a point in township 20 or 21, range 11, 12, 13 or 14, west 4th meridian, in the province of Alberta.

Authorizing it to make the terminus of its line from Lauder westerly at a point at or near Stoughton, on its Arcola branch.

Authorizing it to enter into an agreement with the province of New Brunswick for any of the purposes specified under section 361 of the railway act in respect of a line of railway extending from Norton to Minto, New Brunswick, and for other purposes.

Application will also be made for an extension of time to build the following lines:

From Osborne to a point between Cartwright and Boissevain, Manitoba.

From Otterbourne to Stuartburn, Manitoba.

From a point on the Icelandic river northerly and northwesterly 100 miles, Manitoba.

From Killam to Strathcona, Alberta.

GULF, FLORIDA & ALABAMA.—An officer writes that a con-tract has been given to Charles Merritt, Pensacola, Fla., for work on 80 miles between Pensacola, Fla., and Jasper, Ala. The plans call for a line via Atmore, Ala., Local, Fannsdale, Greensboro and Tuscaloosa. Track has been laid on 63 miles. Some of the work is heavy; maximum grades will be 1 per cent.; maximum curvature 4 deg. There will be two steel bridges, a number of piers, terminals, warehouses and station buildings. The line is being built to carry coal, lumber, cotton, naval stores and agricultural products. Roy C. McGargel, president, 5 Nassau street, New York. G. A. Berry, chief engineer, Pensacola, Fla.

HARRIMAN-MORGAN RAILROAD.—Incorporated in Tennessee with

$10,000 capital, and headquarters at Harriman, to build and operate a railway from a point near Oliver Springs, Tenn., westerly through Crookedfork valley to a point near the intersection of Morgan, Scott and Anderson counties. It is understood that the line will be eventually extended north to a point on the Ohio river. The incorporators include C. E. Hendrick, J. R. McDowell, W. J. Clarke, J. M. Baker and R. B. Cassell.

Houston & Texas Central.—An officer writes that contracts will be let on November 15, for grading 13 miles in Lee county, Tex. This work is on a section of the branch line being built between Stone City, on the Brazos river, at a point at or near Giddings. Bids for building the rest of the line will probably be asked for within 60 days. E. B. Cushing, engineer of construction, Houston.

Marshall & East Texas.—An officer writes, regarding the report that an extension is to be built from Elysian Fields, Tex., south to Newton, about 120 miles; also from Winsboro north to Paris, about 50 miles, that while the company has had the question of building extensions under consideration for sometime, nothing definite has yet been decided regarding the carrying out of this work. R. J. Lockwood, chief engineer, Marshall. (October 27, p. 860.)

Northern Pacific.—The report of this company for the year ended June 30, 1911, shows that work on the Oregon Trunk Railway has been continued and grading has been finished to Bend, Ore., 156 miles from Fallbridge, on the Columbia river, where a connection is made with the Spokane, Portland & Seattle, and track has been laid to Opal City, 126 miles. The bridges over the Columbia river at Fallbridge, and over the Crooked river at Opal City, are nearly completed, and track laying is expected to be finished to Bend by November. Arrangements have been made to extend the Oregon Electric Railway from Salem, Ore., to Albany, about 60 miles. Work on the United Railways Company has been continued, and this line is now in operation between Portland, Ore., and Banks, 28 miles. During the year an extension of 22 miles was built on the Pacific & Eastern, making a total of 33 miles now in operation, from Medford, Ore., to Butte Falls. Grading was finished in 1910 and track laying was to be completed, ready for operation, in October, on the double track work, and change of line and grade, between St. Cloud, Minn., and Rices, 14.79 miles. Second main track has been laid on 2.68 miles from St. Paul to the Minneapolis (Line B) freight line. Grading for second main track was finished on the line in 1910 between Bloom, N. D., and Jamestown, 4.99 miles, but on account of a decrease of business this work has been postponed. Grading was finished in 1910 on a branch from Pingree to Wilton, 92.5 miles. There are now 42 miles of line completed, and it is expected to have all the work finished in time to handle this year's grain crop over the new branch. On the Missouri River Railway the Mandan North line, 53 miles, improvements are being made to the track from Mandan, N. D., to Sanger. Grading is finished from Glendive, Mont., northern along Yellowstone river, 55 miles, also the bridge over the Yellowstone river and track is now being laid. It is expected that work will be finished this autumn on second main track, and a change of line and grade from Huntley, Mont., to Billings, 12.63 miles. On the Bitter Root extension, 2.76 miles, in Montana, 1.65 miles of track is now in operation and the balance of the work has been postponed. Revision work is now under way to remove a few small humps and sags and to reduce the eastbound grade to 0.4 per cent. from Clark's Fork, Idaho, to Odgen, 7.62 miles. Work is expected to be finished this autumn, removing some bad curvatures along the shores of Lake Cocalalla, Idaho, and all the work to reduce curvatures and improve the line on 0.5 miles has been completed at Algoma. Grading has been finished and most of the track is laid over the second main track from Mile Post 73 on the Idaho division, to Yardly, near Spokane, Wash., 7.9 miles. A contract for a bridge over the Spokane river has been let, and work is expected to be finished this fiscal year. Minor grading revision work will be completed from Moab to Trenton, 2.93 miles, and second main track is now in operation from Spokane to Wins, 4.94 miles. No work has been done on the Point Defiance line, between Tacoma and Tenino, owing to the delay in securing necessary franchises. These negotiations have been completed, and it is expected to begin work during this fiscal year. Work has been pushed during the year on the second main track, and grade changes from Tenino to Vancouver. All of the grading is done and all track and bridge work is expected to be finished by November 15. W. L. Darling, chief engineer, St. Paul, Minn.

Oregon Southern.—Incorporated in Washington with $2,000,000 capital and headquarters at Seattle, the company plans to build from Ashland, Ore., northwest via Medford and Jacksonville to Grants Pass, thence north to Eugene, about 175 miles. A branch may eventually be built to Port Orford and other branches in Oregon and California. J. A. Doyle, Spokane, Wash., H. M. Farren, Boise, Idaho, and C. Radenbough, Corning, Cal., are the incorporators.

Oregon-Washington Railroad & Navigation Company.—To secure a new route across the Cascade mountains from North Yakima, Wash., west to Tacoma, and Seattle, the West Coast Railroad Co. was incorporated to carry out this work. A preliminary survey was made last summer and a portion of the line has been located. The new line is to connect with the Chicago, Milwaukee & Puget Sound a few miles south of Auburn. In crossing the Cascades, the line from the west will follow the White river to the mouth of the Greenwater river, thence up the Greenwater river to the Naches Pass and then down the Naches river to North Yakima. The lower portion of the line on the west side of the mountains, from Auburn to the mouth of the Greenwater river, about 35 miles, has been located with a maximum grade of 1.15 per cent. From the mouth of the Greenwater over the mountains two preliminary lines were run, one for a miximum gradient of 3 per cent. and one for a maximum grade of 4 per cent. It is probable that the latter will be selected. Electric power is to be used on the steep grade, according to the plans of the company, and a number of power sites have been located. As located the curves were spiraled for a speed of 35 miles an hour with a maximum degree of curvature of 6 deg. The work on the west side of the mountains will be heavy, this includes a number of tunnels. The longest tunnel is to be at the lower end of the White river canyon and will be about 3,800 ft. long. A tunnel to be about 2.5 miles long is also planned at the summit, to facilitate an easy grade up the mountains. There will be two crossings of the White river, though both are easy. The new line will pass through Buckley, on the Northern Pacific, between Kanaskat and Puyallup. The country through which it will pass is very rich in both timber and coal, a great deal of that on the west side of the mountains never having been burned or logged. It is understood that the line will be built in the near future to provide an outlet for traffic from the Yakima valley to the Pacific coast. The route will be between 30 and 40 miles shorter than the present Northern Pacific line. R. E. Strahorn, vice-president, Spokane. (November 3, p. 932.)

Palm Beach, Okeechobee & Western (Electric).—Application will be made for a charter in Florida to build an electric line from Palm Beach, Fla., west to Fort Myers, about 140 miles. R. J. Martin, J. H. Borders, W. W. Marquis and J. Matthews, Kansas City, Mo., are interested.

Washington Trunk.—Incorporated in Washington with $5,000,000 capital, to build from Portland, Ore., northeast via Vancouver, Wash., to North Yakima, about 150 miles. It is understood that the line will cross the Cascade mountains at Klickitat Pass. The incorporators include C. C. Craig, of Hartman & Thompson, Portland; W. P. Conaway, of the Vancouver National Bank, and Elmer E. Waite, Vancouver.

West Coast Railroad.—See Oregon-Washington Railroad & Navigation Co.

RAILWAY STRUCTURES.

Brinkley, Ark.—The Chicago, Rock Island & Pacific has prepared plans for a new passenger station at Brinkley, to cost about $25,000. The main building will be 34 ft. x 61 ft., with a wing 19 ft. x 63 ft. on either side, of brick construction with steam heat and electric light.

Cottage Grove, Ind.—The State Railroad Commission of Indiana has ordered the construction of five railway stations as follows: One by the Cincinnati, Hamilton & Dayton, and another by the Chesapeake & Ohio, at Cottage Grove. The Lake Erie

& Western and the Grand Trunk are to build a joint station at Stillwell; Vandalia Railroad, at Macksville near Terra Haute, and the Chicago & Erie, at Bippus.

JOHNSTOWN, PA.—See Morrellville, Pa.

KANSAS CITY, MO.—The Kansas City Terminal Company has let to Bernard Corrigan, Kansas City, the contract amounting to $350,000, for building the Burlington connection, together with bridge abutment and retaining walls. This connection extends from St. Louis avenue to Twenty-fourth street, and will enable trains arriving over the Hannibal bridge to enter the new union station. The work will include the excavation of about 200,000 cu. yds. of earth. (October 27, p. 861.)

The Chicago & Alton has let contracts to the Toledo Bridge & Crane Company for three 90-ft. turntables to replace 65-ft. tables at Kansas City, Mo., Slater, Mo., and Venice, Ill.

The Chicago & Alton is preparing plans for a new boiler shop, a machine shop 60 ft. x 64 ft. and a hot water well.

MORRELLVILLE, PA.—An officer of the Pennsylvania Railroad writes that two ordinances for the elimination of two grade crossings in Morrellville and at Broad street in Johnstown, have been submitted to the city council. The Pennsylvania Railroad agrees to carry out the following work: Build an over-head bridge at Laurel avenue, of steel or concrete construction; a subway at Fairfield avenue; a pedestrian subway at Delaware avenue and raise the Brownstown bridge. The street railway company will pay part of the cost of these improvements.

NEW YORK CITY.—See an article on page 956 regarding the contracts for New York Connecting Railroad bridge work.

OAKLAND, CAL.—A contract has been given to E. G. Griggs, San Francisco, Cal., to build an addition to the freight car repair shop of the Western Pacific at Kirkham street, in Oakland. T. J. Wyche, chief engineer, San Francisco, Cal.

OROVILLE, CAL.—Plans are being made by the Northern Electric, it is said, for putting up a new passenger station at Oroville. The estimated cost of the station is $12,000. A. D. Schindler, general manager, San Francisco, Cal. (May 26, p. 1225.)

OSSINING, N. Y.—A recent order of the New York Public Service Commission, Second district, provides that Secor road shall be carried over the grade of the railway on a steel viaduct, Main street and Quimby crossings are to be closed and discontinued, and at these places overgrade steel foot bridges, 7 ft. wide, are to be constructed. Washburn alley is to be closed and discontinued across the tracks of the railway company. Broadway is to be extended and carried over the tracks by a plate girder bridge with a roadway of 26-ft. and 4-ft. concrete sidewalk on the southerly side, and a continued roadway extension on the south end of the Broadway viaduct approach to Secor road will be constructed.

PENSACOLA, FLA.—The Louisville & Nashville is contemplating building a new passenger station at Pensacola. Tentative plans are being prepared, but no definite action has been taken.

PHILADELPHIA, PA.—The Pennsylvania Railroad announces that the company would proceed at once with the preparation of plans for the construction of a modern grain elevator at Girard Point. The new elevator will be of concrete construction, and, including the concrete grain bins attached to it, will have a capacity of 1,000,000 bushels. Grain driers, with modern machinery for the proper care of grain, will also be provided.

RICHMOND, CAL.—The Southern Pacific, it is understood, will build a terminal at Brooks Island, which is at the southern end of the city of Richmond. W. Hood, chief engineer, San Francisco, Cal.

RHINELANDER, WIS.—The Minneapolis, St. Paul & Sault Ste. Marie has let the contract for building a new passenger station at Rhinelander. The structure will be of brick, one story high, with limestone trimmings and slate roof, and will cost approximately $25,000. Bell, Tyrie & Chapman, Minneapolis, are the architects.

SLATER, MO.—See Kansas City, Mo.

VENICE, ILL.—See Kansas City, Mo.

WILKIE, SASK.—The Canadian Pacific is contemplating the erection of a 16-stall roundhouse and machine shops.

Railway Financial News.

DELAWARE, LACKAWANNA & WESTERN.—This company has declared a dividend of 35 per cent., payable in stock of the Lackawanna Railroad Company, which will call for payment of about $10,600,000 of this 4 per cent. guaranteed stock. The Lackawanna Railroad Company was organized in 1908 to build a cut-off from Slateford, Pa., to Port Morris, N. J., 28 miles. This cut-off shortens the main line of the Delaware, Lackawanna & Western by 12 miles, the D., L. & W. guaranteeing 4 per cent. dividends which call for payment by the D., L. & W. of $425,000.

IOWA CENTRAL.—See Minneapolis & St. Louis.

KANSAS CITY, MEXICO & ORIENT.—This company has asked authority from the Kansas railway commission to issue $20,000,000 gold notes to pay for general construction in Mexico and southern Texas. When these notes are sold it is estimated that the company will have enough money to complete its lines in Texas and to complete the larger part of the lines in Mexico.

MIDDLETOWN, UNION & WATER GAP.—A committee composed of Garrett T. Townsend, of Middletown, N. Y.; Newman Erb, Charles I. Henry and Ferdinand V. Sanford has been formed to protect the interests of the first mortgage bondholders. The interest due November 1, 1911, on these bonds is not paid. The road is leased and operated by the New York, Susquehanna & Western.

MINNEAPOLIS & ST. LOUIS.—Committees acting jointly for the Minneapolis & St. Louis and the Iowa Central have agreed to recommend the lease of the Iowa Central to the Minneapolis & St. Louis, the M. & St. L. to issue $9,370,200 common stock, $1,917,500 preferred stock and $2,500,000 5 per cent. refunding and extension mortgage bonds to be exchanged for the property of the Iowa Central subject only to its funded and other debt, and from the bond sale $2,500,000 cash is to be provided for corporate purposes.

NATIONAL RAILWAYS OF MEXICO.—Kuhn, Loeb & Co., Speyer & Co., Ladenburg, Thalmann & Co. and Hallgarten & Co., all of New York, have loaned to the National Railways of Mexico for one year $13,000,000. A former loan of $5,000,000 matures on December 1. The remainder of the money will be used for improvements, betterments and construction. The loan is secured by bonds of the National Railways.

QUANAH, ACME & PACIFIC.—President Lazarus is quoted in the St. Louis *Republic* as saying: "We have sold the bonds of this company and disposed of part of the stock. I retain an interest in the company and will continue to manage its affairs. . . . Our traffic relations are made somewhat closer with the St. Louis & San Francisco, and that company will use our station and terminal at Quanah. The independent management of the company will remain as it is."

ST. JOSEPH & GRAND ISLAND.—Suit has been brought in the district court of Clay County, Nebraska, asking for the appointment of a receiver for the St. Joseph & Grand Island and for an injunction preventing the Union Pacific from directing the expenditure of funds of the St. Joseph & Grand Island. The protective committee which brings the suit is said to represent about $1,500,000 first preferred stock. The complaint says that the surplus earned by the company has been spent for relaying 118 miles of track with 80-lb. rail and ballasting it with rock, which improvement of the property accrues to the Union Pacific, which uses this 118 miles as part of its main line, and to the common stockholders to the loss of the preferred stockholders who were entitled to this surplus as dividends. The Union Pacific owns a large majority of the common stock. Judge Lovett is quoted as saying: "We are applying to the St. Joseph & Grand Island the same policy of management that is observed in the conduct of affairs of the Union and Southern Pacifics throughout. We are managing the property exactly as we would if we owned every share of each class of the company's stock. The improvements made and being made on the property are not for the benefit of the Union Pacific, but to enable the St. Joseph & Grand Island to handle the business which the Union Pacific has to turn over to it."

UNION PACIFIC.—See St. Joseph & Grand Island.

FIFTEENTH ANNUAL REPORT OF THE NORTHERN PACIFIC RAILWAY COMPANY.

OFFICE OF THE
NORTHERN PACIFIC RAILWAY COMPANY,
ST. PAUL, MINNESOTA,
September 23, 1911.

To the Stockholders of the

NORTHERN PACIFIC RAILWAY COMPANY.

The following, being the Fifteenth Annual Report, shows the result of the operation of your property for the fiscal year ending June 30, 1911:

INCOME ACCOUNT.

REVENUE FROM TRANSPORTATION:	1910.	1911.	Increase or Decrease.
Freight	$48,758,736.25	$43,332,918.23	—$5,425,818.02
Passenger	21,333,312.84	17,278,812.52	—4,054,500.32
Other revenue from transportation	3,671,816.80	3,456,962.01	—214,854.79
Totals	$73,763,865.89	$64,068,692.76	—$9,695,173.13
REVENUE FROM OPERATION other than transportation	761,960.30	844,139.13	82,178.83
Total operating revenue	$74,525,826.19	$64,912,831.89	—$9,612,994.30
Per mile (average)	$12,927.67	$10,908.93	—$2,018.74
OPERATING EXPENSES:			
Maintenance of way and structures	$10,842,955.20	$8,065,462.47	—$2,777,492.73
Maintenance of equipment.	8,992,137.09	7,911,231.46	—1,080,905.63
Traffic expenses	1,036,403.62	1,127,233.05	$90,829.43
Transportation expenses	24,045,197.09	21,601,477.48	—2,443,719.61
General expenses	1,070,712.33	1,024,356.05	—46,356.28
Totals	$45,987,405.33	$39,729,760.51	—$6,257,644.82
Per mile (average)	$7,977.24	$6,676.79	—$1,300.45
Net operating revenue	$28,538,420.86	$25,183,071.38	—$3,355,349.48
Per mile (average)	$4,950.43	$4,232.14	—$718,29
OUTSIDE OPERATIONS:			
Sleeping, parlor, observation, dining and cafe cars and restaurants	$602,474.89	$441,802.83	—$160,672.06
Total net revenue	$29,140,895.75	$25,624,874.21	—$3,516,021.54
TAXES ACCRUED:	3,621,999.80	3,296,797.49	—325,202.31
Per mile (average)	628.29	554.04	—74.25
Operating income	$25,518,895.95	$22,328,076.72	—$3,190,819.23
OTHER INCOME:			
Dividends and interest on securities, interest on deposits and miscellaneous	2,506,474.91	2,705,981.83	$199,506.92
Rentals received	1,289,252.04	2,027,352.75	738,100.71
Hire of equipment	160,578.51	607,094.46	446,515.95
Gross income	$29,475,201.41	$27,668,505.76	—$1,806,695.65
DEDUCT:			
Rentals paid	$509,927.90	$561,149.26	$51,221.36
Interest on funded debt	6,669,014.17	6,665,090.00	—3,924.17
Dividends on stock	17,360,000.00	17,360,000.00	....
Totals	$24,538,942.07	$24,586,239.26	$47,297.19
Net income for the year	$4,936,259.34	$3,082,266.50	—$1,853,992.84
Ratio of operating expenses to total operating revenue	61.71%	61.20%	.51%
Ratio of taxes to total operating revenue	4.86%	5.08%	.22%

MILEAGE OPERATED.

Changes have taken place in the mileage operated during the year as follows:

There were added:		Miles.
Nov. 1, 1910.	Missouri River Railway, Mandan, North Dakota, to Cannon Ball Junction, North Dakota, constructed	36.11
Nov. 1, 1910.	Western Dakota Railway, Cannon Ball Junction, North Dakota, to Mott, North Dakota, constructed	91.35
Nov. 1, 1910.	Connell Northern Railway, Connell to Adco and Ritzville Branch, Bassett Junction to Scragg, Washington, constructed	73.49
Nov. 1, 1910.	Orting Branch in Washington, extension	2.57
Nov. 1, 1910.	Bitter Root Branch in Montana, extension	1.65
	Total additions	205.17
DEDUCTIONS		
June 30, 1911.	Gaylord & Ruby Valley Branch in Montana shortened	1.08
June 30, 1911.	Corrections by line changes and rechaining	1.29
	Total deductions	2.37
	Net additions	202.80
	Mileage operated June 30, 1910	5,814.12
	Mileage operated June 30, 1911	6,016.92
	Average mileage operated during the year	5,950.43

EARNINGS.

FREIGHT BUSINESS.

Freight revenue was $43,332.918.23, a decrease of $5,425,818.02 or 11.3 per cent. from the previous year.

4,800,666,026 tons of revenue freight were moved one mile, a decrease of 618,418,339 tons one mile, or 11.41 per cent, from the previous year.

The rate per ton per mile increased from .00900 to .00903.

The revenue train load increased from 429.28 to 461.45 tons. The total train load, including company freight, increased from 523.65 to 553.12 tons.

The miles run by revenue freight trains was 9,771,713, a decrease of 2,267,880 or 18.84 per cent.

PASSENGER BUSINESS.

Passenger revenue was $17,278,812.52, a decrease of $4,054,500.32, or 19.01 per cent. from the previous year.

Mail revenue was $980,235.82, a decrease of $52,655.30 or 5.10 per cent.

Express revenue was $1,409,120.41, a decrease of $163,879.70 or 10.42 per cent.

Excess baggage and miscellaneous passenger revenue was $298,585.74, a decrease of $34,882.88 or 10.46 per cent.

The total revenue for persons and property carried on passenger trains was $19,966,754.49, a decrease of $4,305,918.20 or 17.74 per cent from the previous year.

The number of passengers carried was 9,262,853, a decrease of 377,141 from the previous year, and the number of passengers carried one mile was 759,276,059, a decrease of 217,496,034 or 22.27 per cent.

The miles run by revenue passenger trains was 11,380,355, a decrease of 1,194,552 or 9.50 per cent.

The rate per passenger per mile was .02276 and .02184 last year.

OPERATING EXPENSES.

CONDUCTING TRANSPORTATION.

The charges for transportation expenses were $21,601.477.48, a decrease of $2,443,719.61 or 10.16 per cent.

MAINTENANCE OF EQUIPMENT.

The charges for Maintenance of Equipment were $7,911,231.46, a decrease of $1,080,905.63 or 12.02 per cent.

LOCOMOTIVES.

Total number of locomotives on active list June 30, 1910		1,430
Additions:		
Pacific type passenger locomotives purchased		18
		1,448
Deductions:		
Sold	6	
Dismantled	1	
	—	7
Total number on active list June 30, 1911		1,441
In addition to those on the active list there are held for sale		26
Total locomotives owned		1,467

HAULING CAPACITY.

Active List.	*Number.*	*Tractive Power. (Pounds.)*	*Total Weight on Drivers. (Pounds.)*	*Total Weight of Engines. (Pounds.)*
Assignment June 30, 1910	1,430	43,807,900	197,858,542	250,163,502
Added during fiscal year	18	585,000	2,646,000	4,293,000
Total	1,448	44,392,900	200,504,542	254,456,502
Sold and dismantled	7	116,000	519,404	664,504
Total	1,441	44,276,900	199,985,138	253,791,998

The following statement shows the character and condition of the locomotives of the company on June 30, 1911:

Wheel Arrangement.	*Owned June 30, 1910.*	*Condemned Destroyed and Sold.*	*Added.*	*Owned June 30, 1911.*	*Average Weight of Locomotive without tender* (Tons of 2000 lbs. *Total.*)	(Tons of 2000 lbs. *On Drivers.*)	*Average Tractive Force, Lbs.*
○○ △	3	1	...	2	24.37	22.75	8,100
○○○ △	206	2	...	204	60.83	60.83	25,381
○○○○ △	9	...	...	9	68.50	68.50	26,500
○○○○△	139	...	...	139	53.38	44.34	18,155
○○○○△△	143	...	...	143	88.77	76.68	37,440
○○○○○△△	2	...	...	2	72.51	65.27	34,800
○○○○△△	127	3	...	124	44.77	28.40	13,880
○○○○○△△	292	1	...	291	79.36	59.48	26,120
○○○○○△△	4	...	...	4	93.00	73.00	38,500
○○○○○△△	6	...	...	6	84.39	43.85	21,550
○○○○○△△	154	..	18	142	112.76	71.36	31,517
○○○○△△	150	...	...	150	102.25	76.75	33,300
○○○○○△△	220	...	...	220	130.35	101.68	46,300
○○○○-○○○△△	22	...	...	22	170.70	150.72	64,940
○○○○○-○○○○△△	5	...	...	5	218.98	201.90	89,540
Geared locomotives	4	...	...	4	63.32	63.32	29,250
Total	1,456	7	18	1,467	87.24	68.28	30,426

Condition.	*Number.*	*Per Cent.*
Good	1,136	77.44
Fair	199	13.57
At shops	132	8.99
	1,467	*100.00*
Number of oil burning locomotives	21	1.43
Number of locomotives equipped with superheaters	94	6.40

PASSENGER EQUIPMENT.

On June 30, 1910, the company owned 1,119 passenger train cars, including 131 sleeping cars owned jointly with the Pullman Company; on June 30, 1911, 1,161 passenger train cars, including 130 sleeping cars owned jointly with the Pullman Company, a net increase of 42. The number and kind of cars owned is shown in table on page 40.

On June 30, 1911, of the 1,161 cars owned 886 cars were not due in shops for two months or more.

FREIGHT EQUIPMENT.

Comparative number and capacity of freight cars:

	1910		1911		Increase or Decrease.	
	Number.	Capacity (Tons of 2000 lbs.)	Number.	Capacity (Tons of 2000 lbs.)	Number.	Capacity (Tons of 2000 lbs.)
Box	24,357	880 887	23,787	865,700	*570*	*15,187*
Furniture	638	19,770	594	18.670	*44*	*1,100*
Refrigerator	1,562	39,675	1,566	41,425	4	1,750
Stock	2,618	61,250	2,579	58,095	*39*	*3,155*
Flat	8,614	291,030	8,400	288,555	*214*	*2,475*
Oil	18	475	18	475	...	....
Coal	5,193	216,955	5,353	229,655	160	12,700
Ballast and Ore	816	32,640	803	32,120	*13*	*520*
Totals	43,816	1,542,682	43,100	1,534,695	*716*	*7,807*
Percentage	....	.....	....	.....	*163%*	*52%*
Average capacity per car	....	35.2	....	35.6	...	....

NOTE.—Figures in italics denote decrease.

Of the total number of freight cars on the road on June 30, 1911, only 1,132 or 2.63 per cent. were in need of repairs costing $5.000 or more per car.

In addition to equipment shown as on hand June 30, 1911, the following will be built at the Company's shops during the current year.

FREIGHT TRAIN CARS.

Box cars, 40 tons capacity 500

DEPRECIATION OF EQUIPMENT.

In accordance with the rules of the Interstate Commerce Commission the following amounts have been charged to operating expenses on account of estimated depreciation of equipment, viz.:

Locomotives	$784,138.20
Passenger cars	190,345.25
Freight cars	1,100.758.68
Work cars	41.742.08
Floating equipment	5,043.36
	$2,122,027.57

MAINTENANCE OF WAY AND STRUCTURES.

The charges for Maintenance of Way and Structures were $8,065,462.47, a decrease of $2,777,492.73 or 25.62 per cent.

The table in the report of the Comptroller, page 30, shows the distribution of this decrease under the respective accounts.

The following statements give particulars of the work done and show that the property has been well maintained.

PERMANENT WAY.

	1910.	1911.
New main line laid with 85 pound rail.....miles	2.40	....
New second track laid with 85 pound rail..... "	5.33	6.76
New second track laid with 90 pound rail.... "	45.23	54.59
New second track laid with 72 pound rail.... "	....	2.64
New third track laid with 72 pound rail..... "	....	1.38
New branch lines laid with new 90 pound rail.. "	....	12.26
New branch lines laid with 72 pound rail..... "	....	188.69
New branch lines laid with 56 and 60 pound rail "	....	2.57
Main line relaid with new 90 pound rail..... "	741.47	136.68
Main line relaid with new 85 pound rail..... "	31.16	....
Branch line relaid with new 90 pound rail.... "	9.00	....
Main line relaid with 66, 72 and 85 pound rail.. "	....	22.97
Second track relaid with new 90 pound rail.... "	36.06	10.80
Second track relaid with 85 pound rail..... "	....	1.35
Branch lines relaid with new 90 pound rail.... "	....	6.61
Branch lines relaid with 66. 72 and 85 pound rail "	....	100.45
Sidings and spurs constructed..... "	75.86	48.11
Track ballasted ..... "	420.13	341.51
Embankment widened ..... "	370.00	161.34
Cross-tie renewals, main line.....Ties	1,509,404	1,955,840
Cross-tie renewals, branch lines..... "	910,932	1,274,472
Timber bridges replaced by permanent structures and embankments, 84 in number, equal to...miles	5.75	2.14
Timber bridges renewed.....	40	72
Timber culverts replaced.....	101	107
New stock fence constructed.....miles	159.84	78.56
New snow fence constructed..... "	15.59	30.82

RAIL IN MAIN, SECOND AND THIRD TRACKS.

	Miles. 1911	Miles. 1905
90-pound steel	1,108.62	....
85-pound steel	1,999.74	529.19
80-pound steel	2.52	2.10
76-pound steel	5.14	5.14
75-pound steel	....	2.82
72-pound steel	732.57	1,650,40
70-pound steel	41.02	46.65
66 and 67-pound steel	629.75	981.41
60-pound steel	214.71	227.06
56-pound steel	1,695.66	1,973.88
Other weights	10.92	18.29
	6,440.65	5,436.94

NOTE: 72-pound steel has been sold to proprietary and affiliated companies and used in important sidings and terminal yards.

BRIDGES.

During the year, 156 bridges were replaced and 10 abandoned. 72 bridges 11,923 feet in length were replaced by timber structures, and 7 permanent and 77 timber structures were replaced in permanent form, as follows:

Replaced by embankment	35 bridges, 7,764 lineal feet.
Replaced by truss, girder, I-beam and reinforced concrete trestle	49 bridges, 3,536 lineal feet.
Total	84 bridges, 11,300 lineal feet.

107 timber culverts were rebuilt; 36 in temporary and 71 in permanent form.

There are now under construction on operated lines 1,615 lineal feet of steel girder and I-beam spans; 1,364 lineal feet of steel truss spans; 1,400 lineal feet of reinforced concrete trestle; one 325-foot and one 200-foot steel draw spans and one 160-foot bascule draw span; also one steel highway viaduct 738 feet long.

BRIDGES AS THEY EXISTED JUNE 30, 1911.

	No.	Aggregate Length. Lineal Feet.	Aggregate Length. Miles.
Steel, iron, stone and concrete permanent bridges	578	90,935	17.22
Timber and combination iron and timber structures	2,739	429,711	81.38
Totals	3,317	520,646	98.60

Total length of timber structures replaced by steel bridges, embankment, or in other permanent form from July 1st, 1885, when work was commenced, to June 30th, 1911, has been 120.27 miles.

STATION BUILDINGS.

New buildings and structures, or increased facilities, have been provided at the following stations:

Minnesota.
New Duluth
Boat Club Station
Coon Creek
Salida
Becker
De Lamere
Cloquet
Lake Park
Dilworth
Moorhead

North Dakota.
Mandan
Barney
Fargo
Magnolia
Dazey

Montana.
Park City
Terry
Big Timber
Butte
Patney
Red Lodge
Garrison
Plateau
Deborgia
Borax
Lookout
Trident
Clarkston
Orwell
Darby

Washington.
Ritzville
Toppenish
Bellingham
Ellensburg
Tacoma
Spokane
Hartline
Thomas
Auburn
Burnett
Byron
Halterman
Pasco
Scragg

Oregon.
Warren

SHOPS, ENGINE FACILITIES AND YARDS.

Buildings, tracks, turntables, or increased facilities have been provided at the following points:

Wisconsin.
Ashland

Minnesota.
Duluth
Brainerd
Saint Paul
Northtown
Staples

North Dakota.
Dickinson

Montana.
Glendive
Forsyth
Livingston

Idaho.
Wallace

Washington.
Fairfax
Hoquiam
Pluvius

FUEL STATIONS.

Additional or increased facilities have been provided at the following points:

North Dakota.
Dawson
Dickinson

Washington.
Tacoma
Lester

WATER SUPPLY.

Additional or increased facilities have been provided at the following points:

Minnesota.
Moose Lake
Rush City

North Dakota.
Richardton
Dickinson

Montana.
Forsyth
Sanders
Huntley
Clyde Park
Austin
Lothrop

Washington.
Ellensburg

BLOCK SIGNALS AND INTERLOCKING PLANTS.

Automatic block signals or interlocking plants have been installed and placed in service at the following points:

Minnesota.
Between Northtown Junction and St. Cloud.
Saint Cloud.
Manitoba Junction.
Staples to Dilworth.
Carman.
St. Anthony Park—St. Paul.
St. Paul—White Bear Line.

Montana.
Huntley and Billings.
Great Northern Junction.
Billings to Livingston.
Livingston.
Silver Bow.
Garrison.
Garrison to Missoula.
Laurel.

Washington.
Kalama to Vancouver.
Lewis River Bridge.

Oregon.
Willbridge to Portland.
Columbia River Draw Bridge.
Oregon Slough Draw Bridge.
North Portland Junction.
Willamette River Draw Bridge.
North Portland Jct. to Willamette River Draw Bridge.

On June 30, on important main line mileage of 2,485 there were 440.81 miles protected by automatic block signals and 913.74 miles protected by manual block.

DOCKS AND WHARVES.

The work at Duluth and Seattle, referred to in last year's report, has been carried to completion.

CHARGES TO CAPITAL ACCOUNT.

Upon requisition of the Executive Officers, approved by the Board of Directors, expenditures have been made during the past fiscal year for:

REAL ESTATE, RIGHT OF WAY AND TERMINALS:		
At Superior, Wisconsin, real estate	$4,359.39	
St. Paul, Minnesota, real estate	2,967.85	
Minneapolis, Minnesota, real estate	12,541.73	
Laurel, Montana, terminals (Credit)	*5,966.62*	
Paradise, Montana, terminals (Credit)	*163.89*	
Sand Point, Idaho, terminals	1,510.60	
Spokane, Washington, terminals	6,010.75	
		$21,259.81
BRANCHES, LINE CHANGES, GRADE REVISIONS AND SECOND MAIN TRACK:		
One third interest in double track line Vancouver to North Portland, including bridges over Columbia and Willamette Rivers. (Two thirds owned by Spokane, Portland & Seattle Railway Co.) Additional charges	$50,962.91	
Edgeley-Missouri River line, North Dakota	7,900.64	
Pingree west line, North Dakota	347,992.13	
Turtle Lake extension, North Dakota	13,712.61	
Glendive-Helena cut-off, Montana	3,391.12	
Bitter Root Branch extension, Montana	27,453.50	
DeSmet to Paradise, Montana	12,568.65	
White Pine Hill, Montana, grade revision	9,082.03	
Ritzville-Ellensburg cut-off, Washington	14,129.74	
Sunnyside Branch extension, Washington	42,141.55	
Tacoma-Tenino line, Washington	29,978.29	
Gray's Harbor & Columbia River Railway, Washington	370.44	
Ocosta Branch extension, Washington	3,440.58	
Rights of way at Seattle, Washington, for change of line and new tracks	85,037.17	
St. Paul to Minneapolis, Minnesota, second main track	36,682.83	
St. Cloud to Rice's, Minnesota, second main track	286,963.28	
Philbrook to Staples, Minnesota, second main track	116,940.35	
Wadena to Lake Park, Minnesota, second main track	100.75	
Lake Park to Glyndon, Minnesota, second main track (Credit)	*263.12*	
Wheatland to Buffalo, North Dakota, second main track	591.91	
Alta to Berea, North Dakota, second main track (Credit)	*9,114.78*	
Bloom to Jamestown, North Dakota, second main track	77,314.03	
Huntley to Billings, Montana, second main track	285,291.62	
Billings to Laurel, Montana, second main track	80,252.42	
Livingston to Muir, Montana, second main track	454.54	
Bozeman to Logan, Montana, second main track	1,651.42	
Garrison to Missoula, Montana, second main track	20,516.42	
Missoula to DeSmet, Montana, second main track	141,599.13	
M. P. 73 to Yardley (Spokane), Washington, second main track	151,349.37	
Yardley to O.-W. R. R. & Nav. Co. Crossing, Washington, second main track	12,243.37	
7th Ave. (Spokane), to Wins, Washington, second main track	132,611.94	
Marshall to Wins, Washington, second main track	3,561.16	
Auburn to Meeker, Washington, second main track (Credit)	*234.62*	
Tenino to Kalama, Washington, grade revision and double track	1,932,732.73	
Kalama ot Vancouver, Washington, second main track	12,254.87	
North Portland to Portland City limits, Oregon, second main track	8,011.95	
Sundry credits (Credit)	*317.62*	
		3,939,355.31
ADDITIONS AND BETTERMENTS:		
Right of way and station grounds	$295,663.96	
Real estate (Credit)	*421,029.43*	
Widening cuts and fills	119,982.56	
Protection of banks and drainage	33,880.91	
Grade reduction and change of line	84,612.13	
Tunnel improvement (Credit)	*22,203.25*	
Bridges, trestles and culverts	308,912.45	
Increased weight of rail	133,077.29	
Improved frogs and switches	4,498.91	
Track fastenings and appurtenances	205,604.11	
Ballast	128,596.87	
Additional main tracks	1,972.09	
Sidings and spur tracks	160,281.84	
Terminal yards	350,290.03	
Fencing right of way	6,757.90	
Improvement of crossings, under or over grade	19,236.35	
Elimination of grade crossings	162,969.95	
Interlocking apparatus	23,591.91	
Block and other signal apparatus	404,891.32	
Telegraph and telephone lines	64,900.35	
Station buildings and fixtures	386,430.28	
Roadway machinery and tools	722.15	
Shops, enginehouses and turntables	401,948.92	
Shop machinery and tools	56,418.34	
Water and fuel stations	85,661.02	
Dock and wharf property	46,356.09	
Snow and sand fences and snow sheds	545.60	
Other additions and betterments (Credit)	*40,491.56*	
		3,004,079.09

NEW EQUIPMENT:	*Total Expenditure.*	*Less used from Reserves.*	*Charged Capital.*	
Locomotives	$417,820.70	$30,130.35	$387,690.35	
Passenger train cars	365,982.57	58,125.63	307,856.94	
Freight train cars and work cars	711,777.96	373,913.58	337,864.38	
	$1,495,581.23	$462,169.56		1,033,411.67
Total for the Year				$7,998,105.88

In addition to the above amount added to the cost of the Northern Pacific Estate, advances have been made to sundry companies as follows:

Clearwater Short Line Railway Company	$98,758.97
Missouri River Railway Company	1,907,041.66
Western Dakota Railway Company	1,177,246.47
Shields River Valley Railway Company	5,239.63
Connell Northern Railway Company	568,764.65
Olympic Peninsular Railway Company	6.75
Kennewick Northern Railway Company	169.85
Bear Creek & Western Railway Company (Credit)	*4,829.38*
Northern Pacific Terminal Company of Oregon—account of Sinking Fund	*412,387.21
Advances account of sundry surveys	56,381.60
Total	$4,221,167.41
Less—	
Settlement of advances made to Spokane, Portland & Seattle Railway Company (and its subsidiary companies) by receipt of its securities	$29,818,997.95
Net reduction during the year	$25,597,830.54

*Northern Pacific contribution to the Sinking Fund taken up as an advance in accordance with requirements of the Interstate Commerce Commission.

CAPITAL STOCK AND DEBT.

There has been no change in the amount of capital stock outstanding during the year, viz.: $248,000,000.00.

Changes in Bonded Debt were as follows:

Prior Lien bonds purchased with Net Moneys of the Land Department as provided in Article Eight, Section 2 of Mortgage amounting to	$493,000.00
St. Paul & Northern Pacific Railway Co. mortgage bonds purchased with Net Land Receipts, as provided in Section 25 of mortgage, amounting to	134,000.00
Decrease in bonded debt	$627,000.00

During the year bonds held as Treasury Securities were sold to provide funds for general construction purposes—

Prior Lien bonds	$750,000
Northern Pacific-Great Northern Joint 4's	2,550,000
C. B. & Q. General Mortgage 4's	100,000
	$3,400,000

SPOKANE, PORTLAND & SEATTLE RAILWAY COMPANY.

The results of the operation of the Spokane, Portland & Seattle road (including the Astoria & Columbia River R. R., merged March 1, 1911) for the years ending June 30, 1910 and 1911 were:

	1910.	*1911.*
OPERATED MILEAGE.	*549.30*	*550.95*
Operating revenue	$4,334,278.84	$5,453,459.14
Operating expenses	2,855,323.85	2,662,122.37
Net operating revenue	$1,478,954.99	$2,791,336.77
Outside operations	8,570.71	5,729.37
Total net revenue	$1,487,525.70	$2,797,066.14
Less taxes	327,630.87	470,300.00
Operating income	$1,159,894.83	$2,326,766.14
Other income (rents, etc., received)	383,291.00	726,528.22
Gross income	$1,543,185.83	$3,053,294.36
Rents, interest, hire of equipment, etc	388,672.73	399,879.75
Balance	$1,154,513.10	$2,653,414.61

The gross earnings of this company on business exchanged with the Northern Pacific Railway Company for the fiscal year approximated, $1,725,000.

OREGON TRUNK RAILWAY.

The work of building the Oregon Trunk Railway has continued during the year, and at this date the road is graded to Bend, Oregon, 156 miles from Fallbridge, the point on the Columbia River where connection is made with the Spokane, Portland and Seattle Railway, and track is laid to Opal City, 126 miles. The bridges over the Columbia River at Fallbridge and over the Crooked River at Opal City are nearly completed, and it is expected that the track will reach Bend prior to November 1st next.

OREGON ELECTRIC RAILWAY COMPANY.

The results of the operation of this property for the year as given below, show a gratifying increase over the previous year:

	Last Year.	*This Year.*
Miles operated	71.68	71.68
Total operating revenue	$474,867.40	$616,079.79
Total operating expense	274,120.09	323,512.28
Net operating revenue	$200,747.31	$292,567.51
Taxes	11,450.00	30,403.03
Operating income	$189,297.31	$262,164.48
Miscellaneous income	1,942.45	5,239.62
Gross income	$191,239.76	$267,404.10
Interest on bonds	100,000.00	100,000.00
Balance	$91,239.76	$167,404.10

Arrangements have been made to extend this line from Salem, Oregon, to Albany, Oregon, about 60 miles, and it is expected that the extension will be completed during the fiscal year.

UNITED RAILWAYS COMPANY.

Work on this property has continued and it is now in operation between Portland, Oregon, and Banks, Oregon, a distance of 28 miles, occupying a fertile valley and adjacent to large bodies of very fine timber.

PACIFIC AND EASTERN RAILWAY.

During the year an extension of 22 miles was constructed, making a total of 33 miles now in operation, extending from Medford, Oregon, to Butte Falls, Oregon.

NOTE: All of these properties are owned, controlled and managed by the Spokane, Portland & Seattle Railway Company, the securities of which are owned one-half by your company and one-half by the Great Northern Railway Company.

NEW LINES, DOUBLE TRACK, GRADE REVISIONS AND LINE CHANGES.

MINNESOTA.

Saint Cloud to Rice's, Second Main Track, Line and Grade Change, 14.79 miles.

Grading was completed in 1910 and track will be completed ready for operation by October 15th. Grade is reduced to 0.3 in either direction, distance 0.43 miles and curvature 66° 7'.

St. Paul to Minneapolis (Line B), Freight Line, Second Main Track, 2.68 miles.

This work is now completed except a small amount of bridge work. The new track will expedite movement of business in, out and through the terminals at St. Paul and Minneapolis.

DAKOTA.

Bloom to Jamestown, Second Main Track, 4.99 miles.

Grading was finished in 1910 but on account of lessened volume of business work has been postponed.

Pingree to Wilton, 92.5 miles.

Grading for this branch was finished in 1910, but on account of business outlook work of finishing line was not begun until summer of 1911. At present time 42 miles of road are completed and the line will be ready to handle this year's grain crop and take in fuel and supplies.

Missouri River Railway, (Mandan North Line), 53 miles.

Track Mandan to Sanger is now being put in condition for handling crop which has turned out to be better than expected.

MONTANA.

Glendive East Line, from Glendive Northeastwardly along the Yellowstone River, 55 miles.

Grading on this line and bridge over Yellowstone River is completed and track is now being laid. Grain crop tributary to this line is good and country developing.

Huntley to Billings, Second Main Track, Line and Grade Changes, 12.63 miles.

All work on this will be completed this autumn.

Bitter Root Extension, 2.76 miles.

1.65 miles of track are in service and balance of work has been postponed.

IDAHO.

Tuscor, Line Change, 2.824 feet.

This work is completed.

Clark's Fork to Oden, Grade Revision, 7.62 miles.

This work will remove a few small humps and sags and reduce east bound grade to 0.4%.

Cocalalla, Line Change, 0.8 miles.

Some very bad curvatures along the shores of Lake Cocalalla are taken out by this change. Work will be finished this autumn.

Algoma, Line Change, 0.5 miles.

This work is completed and reduces curvature and improves line.

WASHINGTON.

Mile Post 73 on Idaho Division to Yardley near Spokane, Second Main Track, 7.9 miles.

Grading is all completed and much of track laid. Contract for bridge over Spokane River has been let and work should be finished this fiscal year.

Moab to Trent, Minor Grade Revisions, 2.93 miles.

This work is in progress and will be completed during this fiscal year, grades will be reduced to 0.4 in each direction.

Spokane to Wins, Second Main Track, 4.94 miles.

This track is now in operation.

Point Defiance Line between Tacoma and Tenino.

On account of delay in negotiations about some of the franchises necessary before construction work could be started, no work has been done. These negotiations have been completed and it is expected to begin work during this fiscal year.

Tenino to Vancouver, Second Main Track and Grade Changes.

This work has been pushed during the year, but on account of wet weather and the large number of trains operating between Portland and Tacoma the work has, of necessity, been slow. All of the grading is done and all track and bridge work will be finished by November 15th.

GENERAL.

The very marked business activity of 1909-1910 in the territory served by your company's lines began to decline in the autumn of 1910 and the volume of transactions of all kinds was less than during the previous fiscal year.

The grain crop in North Dakota and Minnesota was seriously damaged and the crop in Washington, Idaho and Oregon was less than usual.

Freight earnings decreased $5,245,818.02; $2,000,000 of this decrease was due to the smaller amount of grain handled, and $1,600,000 to the fact that nearly 10,000 less cars of lumber and shingles were moved, and $700,000 was due to a decrease in the earnings from long haul freight moving from the Mississippi River and points east thereof to Butte, Spokane, Seattle, Tacoma and Portland caused by less construction and expansion of general business facilities; and the same causes affected the earnings at other important towns and cities.

Earnings from operation of passenger trains decreased $4,305,918.20.

The absence during this fiscal year of events like the Alaska-Yukon-Pacific Exposition; the opening of the Flathead, Coeur d'Alene and Spokane Indian Reservations, coupled with a lessened business activity, diminished grain crops and new competition, all contributed to this large decrease in earnings.

Earnings for the year ending June 30th, 1909, for carrying persons and property on passenger trains were $20,117,706.98 compared with $19,966,754.49 for the past year.

The closing down of heavy construction work by railroads, affected the lumber business, and this, with the lessened grain output, reduced the purchasing power of the country and curtailed the movement of agricultural implements, merchandise and manufactured articles.

The crops in Minnesota and North Dakota are much better this autumn than in 1910 although not equal to a good year; the crops in Montana were never better, and there is a marked development of agriculture in the part of that state tributary to your Company's lines. The crops in Idaho, Washington and Oregon are good. The character of the business handled by the Company is changing with the growth of the country, there being a greater proportion of merchandise and short haul business than formerly. The average haul of all freight in 1906 was 342 miles, and this year 279 miles, the average distance traveled by each passenger in 1906 was 111.3 miles and this year 82 miles.

Operating expenses were reduced $6,257,644.82 of which $3,788,917.59 was in labor, and $2,468,727.23 in material and miscellaneous charges.

The arrangements under which your Company's main line is used by the Great Northern between Seattle and Tacoma, and by the Great Northern and Union Pacific between Tacoma and Vancouver, have worked advantageously to all parties and to the public. The work on the Tacoma passenger terminal was completed so far as it can be until the Point Defiance Line is built, and the Terminal is now in use by your Company, the Great Northern and the Union Pacific.

In the Gray's Harbor Country to which the Union Pacific and Chicago, Milwaukee and Puget Sound roads have built a joint line, arrangements were made for the use by those companies of some of your terminals, and by your company of some of their terminals, which it is thought will prevent duplication of facilities, and give the growing cities of Aberdeen, Hoquiam, and Cosmopolis better service.

During the year the Union Pacific System completed and put into operation a branch line of railroad through the Yakima Valley from the Columbia River to North Yakima.

On April 8, 1911, Honorable Walter H. Sanborn, United States Circuit Judge, handed down his decision in the Minnesota Rate Cases, sustaining the findings of the Special Master in Chancery, Ex Judge Charles E. Otis. As a result of this decision, on July 1, 1911, passenger rates in Minnesota were restored to the three cent per mile basis, which was the rate before May 1, 1907, when the two cent basis went into effect in obedience to an act of the Legislature of Minnesota. Also on the same day and in obedience to the decree of Judge Sanborn classified merchandise rates within Minnesota were restored to the basis in effect before November 15, 1906, when reductions ordered by the Minnesota Railroad Commissions became effective.

On June 22, 1911, the Interstate Commerce Commission announced decisions in cases involving the long and short haul clause of the commerce law as applied to Pacific rates compared with rates to Spokane and other points intermediate Missouri River and the coast. This order directs radical changes and reductions in the basis of freight rates between the Missouri River and all points east thereof and points in Montana, Idaho, Washington and Oregon short of the coast.

The report of the Comptroller gives further details of the transactions of the Company.

By order of the Board of Directors,

HOWARD ELLIOTT,
President.

INCOME ACCOUNT.

FOR THE FISCAL YEAR ENDING JUNE 30, 1911.

To *Dr.*			By *Cr.*		
OPERATING EXPENSES:			OPERATING REVENUE:		
Maintenance of way and structures	$8,065,462.47		Freight	$43,332,918.23	
Maintenance of equipment	7,911,231.46		Passenger	17,278,812.52	
Traffic expenses	1,127,233.05		Other	4,301,101.14	
Transportation expenses	21,601,477.48				$64,912,831.89
General expenses	1,024,356.05		OUTSIDE OPERATIONS:		
		$39,729,760.51	Sleeping cars	$405,094.36	
TAXES:			Parlor and observation cars	39,246.20	
State and county	$3,141,939.87		Dining and cafe cars (Deficit)	*96,979.35*	
U. S. Government Corporation Tax	154,857.62		Restaurants	93,931.27	
		$3,296,797.49	Stock yards	510.35	
INTEREST AND RENTALS:					$441,802.83
Interest on funded debt	$6,665,090.00		RENTALS RECEIVED		2,027,352.75
Rentals of leased roads and terminals	556,845.23		HIRE OF EQUIPMENT		607,094.46
Other rentals	4,304.03		MISCELLANEOUS INCOME		6,473.42
		$7,226,239.26	DIVIDENDS AND INTEREST on securities owned and interest on deposits		2,699,508.41
DIVIDENDS:					
Nos. 52, 53, 54 and 55		17,360,000.00			
BALANCE carried to Profit and Loss		3,082,266.50			
		$70,695,063.76			$70,695,063.76

PROFIT AND LOSS ACCOUNT.

JUNE 30, 1911.

To		By	
Discount and commission on treasury bonds sold	$107,243.51	Balance to credit June 30, 1910, as per annual report	$71,166,410.53
Premium on funded debt purchased and cancelled	25,826.25	Balance of Income for year ending June 30, 1911, brought down	3,082,266.50
Settlement account of wreck in 1904	57,519.09	Interest on advances to Spokane, Portland & Seattle Ry. Co. from September 22, 1905, to June 30, 1910	3,679,549.06
Adjustment of rental wiht Astoria & Columbia River R. R. Co.	12,448.66	Sinking fund paid Trustee Northern Pacific Terminal Company Mortgage from September 1, 1896, to June 30, 1910	323,714.76
Balance of sundry accounts written off	7,675.12	Unclaimed wages—3 years old	25,547.47
Balance	78,074,261.88	Profit on operating property sold	7,486.19
	$78,284,974.51		$78,284,974.51
		By Balance to credit of Profit and Loss as per balance sheet.	$78,074,261.88

NORTHERN PACIFIC RAILWAY COMPANY.

GENERAL BALANCE SHEET, JUNE 30, 1911.

ROAD AND EQUIPMENT (Northern Pacific Estate):			CAPITAL STOCK—Common		$248,000,000.00
Cost to June 30, 1907—			MORTGAGE, BONDED AND SECURED DEBT:		
Road, lands, etc.	$318,388,493.45		Mortgage Bonds (page 28)	$190,325,500.00	
Equipment	37,295,670.07	$355,684,163.52	Collateral Trust Bonds (Northern Pacific-Great Northern joint) total issue	$215,227,000.00	
Cost since June 30, 1907—			Less, Great Northern Railway Company's proportion	107,613,500.00	
Road (less Land Department net proceeds)	$40,995,699.48				107,613,500.00
Equipment	11,208,859.42				297,939,000.00
Land Department current assets	4,003,505.20	56,208,064.10			
		$411,892,227.62			
Less reserve for accrued depreciation	10,089,366.86	$401,802,860.76			
SECURITIES:					
Securities of proprietary, affiliated and controlled companies—pledged, viz.:					
This company's one-half of $107,613,500 stock of Chicago, Burlington & Quincy Railroad Company pledged to secure payment of $215,227,000 joint bonds made and issued by this Company and the Great Northern Company to pay for said stock, costing	$109,114,809.76				
Other pledged securities	1,142,448.11	$110,257,257.87			
Securities of proprietary, affiliated and controlled companies—unpledged	49,734,924.46	159,992,182.33			
OTHER INVESTMENTS:					
Advances to proprietary, affiliated and controlled companies for construction, equipment and betterments		26,529,957.78			
Total Capital Assets		$588,325,000.87	Total Capital Liabilities		$545,939,000.00
WORKING ASSETS:			WORKING LIABILITIES:		
Cash	$5,931,723.81		Traffic and car service balances due other companies	$885,996.27	
Securities issued or assumed—held in treasury	16,248,000.00		Audited vouchers and wages unpaid	3,669,737.19	
Marketable securities (other than those issued or assumed)	19,362,918.11		Miscellaneous accounts payable	6,598,474.25	
Loans and bills receivable	53,317.13		Matured interest, dividends and rents unpaid	1,131,909.50	
Traffic and car service balances due from other companies	990,122.28		Other working liabilities	269,204.53	
Net balances due from agents and conductors	660,465.03				12,555,321.74
Miscellaneous accounts receivable	4,118,695.63		ACCRUED LIABILITIES NOT DUE:		
Material and supplies	6,058,227.33	53,423,469.32	Unmatured interest, dividends and rents payable	$4,850,891.13	
ACCRUED INCOME NOT DUE:			Taxes accrued (partly estimated)	1,825,013.05	
Unmatured interest, dividends and rents receivable		822,395.02			6,675,904.18
DEFERRED DEBIT ITEMS:			DEFERRED CREDIT ITEMS:		
Advances	$103,825.25		Other deferred credit items		153,451.56
Special deposits (with Trustees of Mortgages)	523,389.17		APPROPRIATED SURPLUS:		
Cash and securities in Sinking and Redemption Funds	199,859.73		Invested in other reserve funds (Insurance Fund)		5,397,116.90
Cash and securities in Insurance Fund	5,397,116.90	6,224,191.05	PROFIT AND LOSS		78,074,261.88
		$648,795,056.26			$648,795,056.26

MORTGAGE DEBT JUNE 30, 1911.

(EXCLUSIVE OF THE NORTHERN PACIFIC-GREAT NORTHERN JOINT BONDS OUTSTANDING.)

NAME.	*Amount Outstanding.*	*Date.*	*Matures.*	*INTEREST.* *Rate.*	*When Payable.*	*Amount Charged Income for Fiscal Year.**
ISSUED.						
Northern Pacific Ry. Co. prior lien mortgage	$107,028,500.00	1897	1997	4%	Jan., April, July, Oct.	$4,067,600.00
Northern Pacific Ry. Co. general lien mortgage	60,000,000.00	1897	2047	3%	Feb., May, Aug., Nov.	1,567,200.00
Northern Pacific Ry. Co. St. Paul-Duluth Division mortgage.	8,080,000.00	1900	1996	4%	June, Dec.	323,200.00
ASSUMED.						
St. Paul & Northern Pacific Ry. mortgage	7,887,000.00	1883	1923	6%	Feb., Aug.†	473,890.00
St. Paul & Duluth R. R. first mortgage	1,000,000.00	1881	1931	5%	Feb., Aug.	50,000.00
St. Paul & Duluth R. R. second mortgage	2,000,000.00	1887	1917	5%	April, Oct.	100,000.00
St. Paul & Duluth R. R. first consolidated mortgage	1,000,000.00	1898	1968	4%	June, Dec.	40,000.00
St. Paul & Duluth R. R., Taylor's Falls & Lake Superior mortgage	210,000.00	1884	1914	6%	Jan., July	12,600.00
St. Paul & Duluth R. R., Duluth Short Line moragage	500,000.00	1886	1916	5%	March, Sept.	25,000.00
Washington & Columbia River Ry. first mortgage	2,620,000.00	1895	1935	4%	Jan., July	5,600.00
Total	$190,325,500.00					$6,665,090.00

*Interest on bonds in treasury not included above, viz.: Prior Lien Bonds $4,867,000; General Lien Bonds $7,760,000; Washington & Columbia River Railway Bonds $2,480,000.

†Registered Interest payable quarterly.